

TECHNOLOGY

# THE CHEMICAL AGE

VOL LVII

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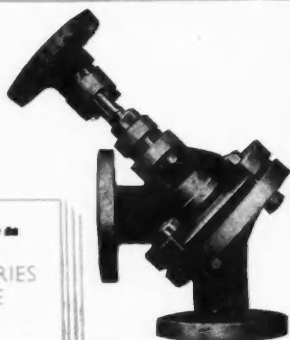
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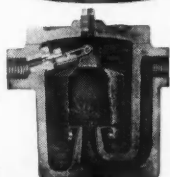
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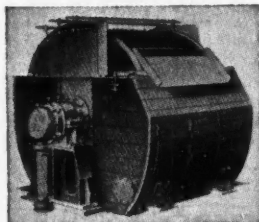
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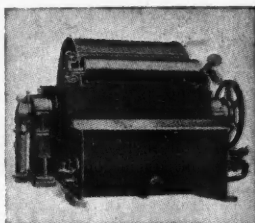
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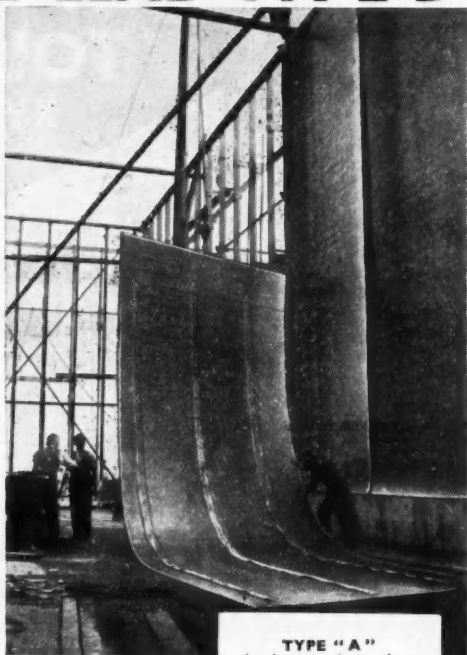
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ANOTHER PAGE FROM THE

## STERLING

VOLUME

Page 17

## Chemicals

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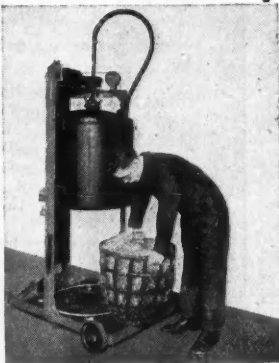
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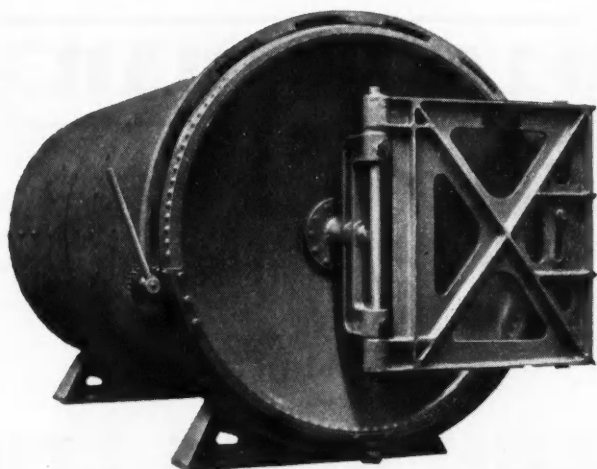
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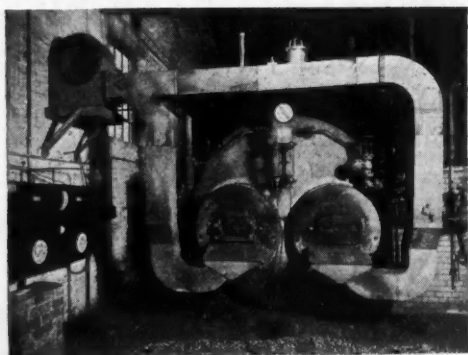
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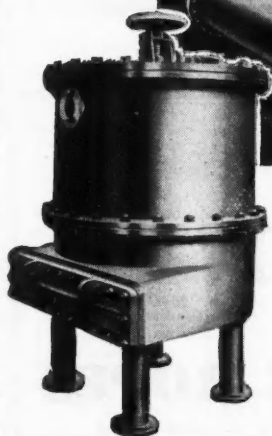
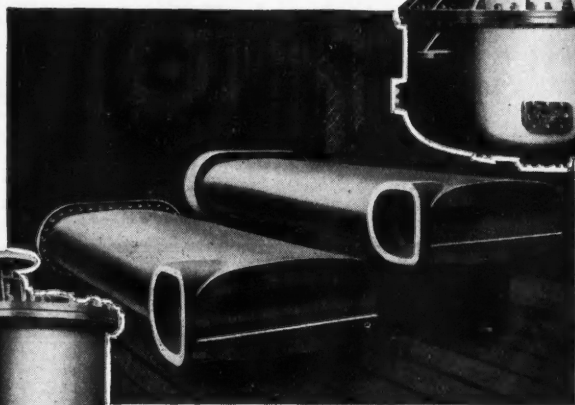
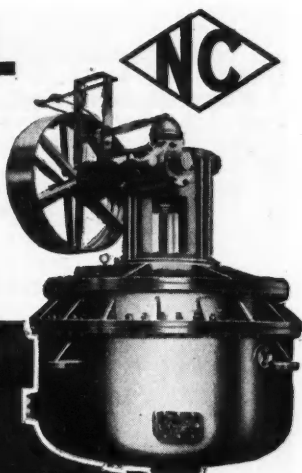
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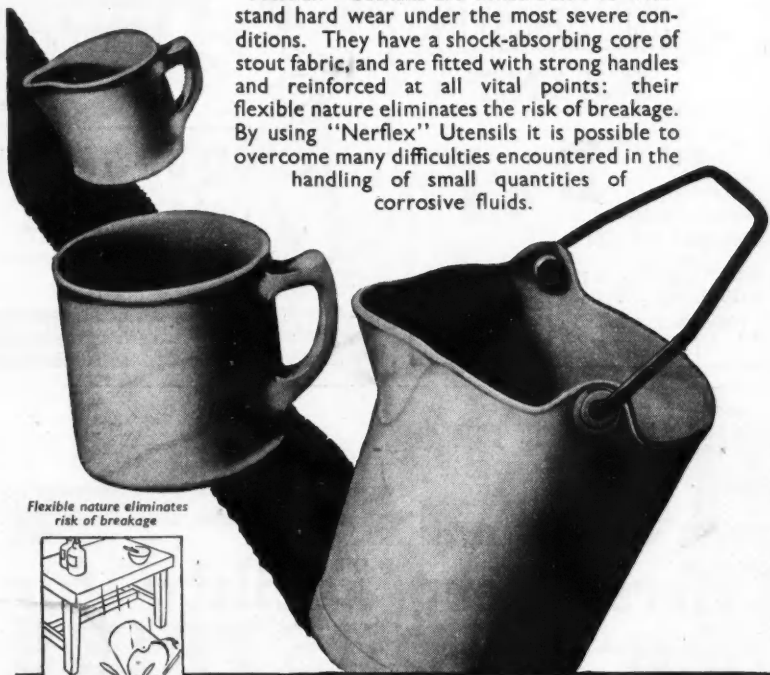
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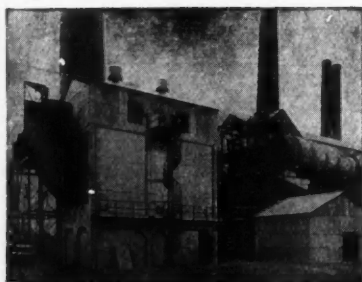
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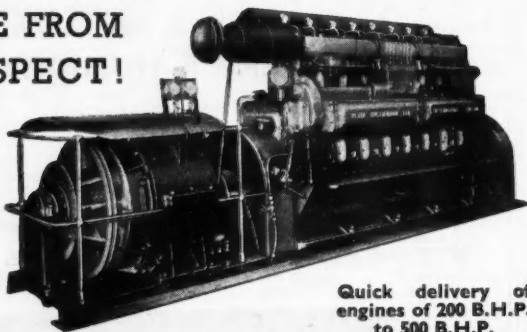
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# The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Telegrams: ALLANGAS FLEET LONDON

Telephone CENTRAL 3212 (12 lines)

SCOTTISH OFFICE:

116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:

Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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## Export Organisation

**D**URING the period when British prosperity was founded, that is to say during the 19th Century, we were virtually the only industrial nation. Consequently other nations were prepared to accept our advice as to whatever design we thought best would suit their requirements. Since they could get what they required from no one else we were able to dictate what they should have, at what price we would supply it, and when we would supply it. For the most part orders were placed by letter and our manufacturers did not find it necessary to visit their clients. Something of this spirit still survives. There is a disposition on the part of manufacturers to accept orders from home clients for whom they have worked in the past and to neglect the foreign buyer. There is still a take-it-or-leave-it attitude towards the foreign purchaser. There is still a disposition to stay at home and wait for the foreign purchaser to come to us rather than to go to them. Many firms are unwilling to pay the cost of having an agent abroad.

All these criticisms can be countered by reasoned argument on the other side. It is unfortunately true that many of our firms are too small to be able to support a whole-time salaried agent abroad. It frequently happens that there is no director who is able to spare the time to make long journeys abroad in search of business; moreover the cost of making these journeys is not negligible. It must be confessed that there is little inducement for firms to seek orders abroad if they have already an adequate home market; the cost of enlarging premises is prohibitive; the possibility of getting permits to do so is remote; even if both these factors are favourable, the time

taken to build a new factory and to get it into production is so long that the markets may have changed considerably before the venture can be established. It is also unfortunately true that many foreign inquiries have always been, and still are, of an unreliable nature upon which a laboratory, a drawing office and an estimating department may spend much time without the remotest likelihood of obtaining an order. It is not unknown for inquiries from eastern countries for plant for the manufacture of chemicals to emanate from students seeking information. Until there is some means of sifting the wheat from the chaff on the spot, it is difficult, and often unprofitable for British manufacturers to set themselves out to do export business except for such plant, chemicals or goods as can be quoted for, as it were, off the shelf.

At a still earlier stage, the smaller concern which comprises two-thirds of British industry, finds it impossible to undertake market research. A firm may decide that it will manufacture for the export market. It has to decide for which countries it will manufacture, how best to secure orders, the type of goods that will be required, and it must have information as to the type of competition it has to face. All this is comprised under the term "market research" and market research is only possible in an organisation large enough to employ the necessary specialists and often to allow those specialists to visit the country concerned. For this reason the Board of Trade encourage what is known as BETRO—The British Export Trade Research Organisation. BETRO was set up by a number of firms who realised from

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their own experience that there must be a change in the haphazard methods of salesmanship which had been so widely followed in pre-war years. It does not sell the goods but it undertakes the market research which charts the geography of the market. For some reason BETRO has not proved generally popular. It has not received the volume of support which had been anticipated. Sir Stafford Cripps voiced his disappointment at this lack of response at the annual luncheon of the organisation recently. He pointed out that the sellers' market is disappearing in many commodities and the time when a buyers' market will replace the sellers' market is now very near. It is a curious, though not altogether unusual, habit of British industry not to worry too greatly about the future. If orders are plentiful, why worry about the orders that will be required to keep the works going the year after next? When orders begin to slacken, that will be the time to exert the arts of salesmanship. This, of course, is a fallacy. Salesmanship should never relax. It may be necessary for the salesman to explain that at the moment he cannot promise rapid delivery but unless he keeps in touch with his customers he will find that when he needs orders they will have been promised to someone else. Nowhere is that more true than in the export market. It is now, when we need export trade, and when the sellers market is disappearing, that the greatest effort should be made to get into touch with foreign clients.

Sir Stafford Cripps has pointed out that BETRO has the staff and set-up that is needed to carry out the market research which is the factual basis for developing our export trade and which is not generally available to exporters within their own organisation. There are two further channels of information. The overseas services staffed by the Civil Service acquire a great mass of general knowledge as to markets, and this information is made available through the Export Promotion Department of the Board of Trade. The more specialised knowledge which requires particular investigation requires a different type of organisation from that of the Export Promotion Department and the Foreign Service. This gap is intended to be filled by BETRO and we are a little puzzled as to why more interest has not been taken in it by British firms. It may be, as we have said, that the fundamental reason is that there is plenty of work about; but, as we have already indicated, that position is now changing and orders are likely to be more difficult to obtain. Sir Stafford Cripps confirmed the imminent change in the character of the markets by pointing out that as the Minister responsible for exports the position was giving him grave anxiety because he knew that "within the next few months we are going to reach the point where we shall have extreme difficulty in achieving that expansion of exports which is vital to our continuing standard of living."

## NOTES AND COMMENTS

### Britain's Atomic Pile

THE news that the first British atomic pile is working is welcome. Although it is only an experimental pile—a pilot plant, we presume—it is already at work producing radioactive isotopes for medical research purposes. In America, as an article in this issue indicates, over 100 different radioactive substances from 60 different elements have already been manufactured in their atomic piles. The uses for these substances are manifold. They are not, though, by any means all being used for medical research. Among some of the interesting experiments now being carried out in the States with these "tagged" atoms are some dealing with friction and investigations into the composition of the molecular layers which adhere to glass and metal. Other work involves the detection of sulphur in various plant compounds. Great strides have already been made in the technique of using radioactive isotopes in medical research, and results from investigations are already being gathered. Although the American work is more than welcome, we should have liked to see British scientists in the forefront in this field. When the larger atomic pile at Harwell comes into operation next year, however, there may be sufficient radioactive materials to enable our scientists to make up the leeway and eventually forge ahead in this work.

### Artificial Rain

FOLLOWING reports of experiments to produce artificial rain and snow, it is not surprising to read that a drought in America has been broken in one of the States by the production of artificial rain by "seeding" a cloud with "dry ice" (solid carbon dioxide at a low temperature). Last year, Mr. Schaefer, the American scientist who pioneered these experiments and who was led up to them by his study of icing conditions for aircraft and the mechanism of ice crystal formation, found a method of producing artificial deposits of snow. He observed that if dry ice in large quantities is sprinkled over snow clouds a fall of snow occurs almost immediately. In February this year 150 lb. of dry ice was dropped on to a large cloud over Sydney, Australia,

By means of radar, watchers of the experiment were able to observe the formation of rain drops inside the cloud. Within five minutes of the dropping of the dry ice there were rain echoes from within the cloud. A further 150 lb. of dry ice intensified the echoes and within 21 minutes of the starting of the experiment heavy rain was seen to be falling from the bottom of the cloud and covering an area of about 20 square miles. Even small quantities of dry ice will produce phenomenal effects. In theory, a single  $\frac{1}{4}$  in. pellet of dry ice, when completely utilised, should produce about 300,000 tons of snow. This cannot be achieved, however, because an ice particle less than a millionth of a centimetre in diameter will evaporate even if water is present. Thus only the bigger particles survive. But meteorologists do not consider the time is near when we shall be able to control our weather by this method. According to Mr. Schaefer, it is necessary to have a continuous flow of moisture into the region in order to produce any considerable amount of snow on the ground. Where there are only isolated clouds in the sky the dry ice method will tend to dissipate them rather than form more. This effect, though, may be useful for dispersal of fogs. During one fog, Mr. Schaefer walked through it waving a wire basket full of dry ice over his head. This changed the character of the fog and left a clear space where he had walked. Although at one time it was thought that foreign nuclei were necessary to produce ice crystal formation, it is now known this is not always the case. In one experiment with a cold chamber at  $-31^{\circ}\text{F}$ . where there was a continuous supply of moisture there was a continuous snow-fall for two weeks.

### The Mine Explosion

COAL, the fuel mainstay, and with petroleum the major source of chemicals, while already the subject of much controversy and back-biting on account of its shortage and the labour problems which its production entails, last week-end jumped into the headlines again when news of the William Pit disaster at Whitehaven was released. From time to time in the annals of the coalmining industry men have died by the hundred to bring this essential

commodity to the surface. That there are attendant dangers is well known both by the workers themselves and by the employers—at this moment the infant National Coal Board. It requires no profound depth of thought to forecast that the disaster cannot but have an adverse effect upon the Board's recruiting programme. This in itself, apart from the loss of life at Whit-haven, is a serious matter, and one that cries aloud for remedial action. Despite the countless regulations (infractions of which carry penalties) designed to prevent accidents, they can at best only reduce them. Fire-damp, the usual cause of explosions can normally be detected by the safety lamp carried only by deputies and lone workers such as pumpmen who may have to visit unfrequented roads and cul-de-sacs. To ask colliers, rippers and others to carry them too would be to impose an unreasonable burden on men already laden with tools, food, water and ordinary lamp, and who are expected to travel long distances over rough ground. Yet the risk of explosions may have to be very considerably reduced if the number of men necessary to raise coal output to the Government's target and beyond is to be recruited. What man of sense (in peacetime that is) will voluntarily jeopardise his

life merely for the sake of earning his living? The issue seems to be this: There has either got to be a higher standard of safety in the mines—in which case the manpower position in the coalmines will at worst remain as it is, or else the old, apparently inadequate standards can be retained—a situation that will demand direction of workers to the pits, *i.e.*, conscription. But on what moral basis can a man be conscripted in PEACETIME to undertake work so dangerous that men die in batches of a hundred or so at a time?

### Better Gas Detection

IT is beyond dispute that present-day safety arrangements are not the best that human ingenuity can devise. It seems to us that the safety-oil lamp is but a primitive instrument for the detection of gas, depending as it does upon the visual preparedness of its bearer and being at the mercy of air currents, water and other factors beyond the power of man to anticipate. The British brains that gave birth to radar to help overcome Hitler in wartime can surely produce an instrument to mitigate if not entirely eliminate the horrors of mass entombment in days of peace.

## BRITAIN'S FIRST ATOMIC PILE

**B** RITAIN'S first atomic pile started up at the Atomic Energy Research Establishment, Harwell, during the past week-end.

This pile, known as the Gleep (Graphite Low Energy Experimental Pile), is the first major unit to be completed at Harwell, and has been built primarily for experimental work in nuclear physics. It will, however, be used for the time being, until the more powerful Harwell pile comes into operation in 1948, for the production of small quantities of radioactive isotopes for biological and medical research. These radioactive materials are required in the first place for the work of the Medical Research Council, but their use is likely to extend, in science generally and in industry.

The pile has been designed largely by a New Zealand group of scientists working at Harwell. Many British scientists have contributed to the production of the pure graphite and uranium, and have designed and produced the instruments required for the pile. Considerable assistance has also been obtained from Canada, particularly in the testing of graphite.

The engineering and constructional work on the pile has been done by the Ministry of Works and its contractors, W. E. Chivers & Sons, Ltd., and Mathew Hall & Co., Ltd., in fifteen months from starting work on the site. This rapid construction has been achieved through hard work and interest on the part of the construction workers employed.

### Tin Plate Production in Australia

**W** ITH a view to launching a £10 million tinplate venture in Australia, three special representatives of Broken Hill Pty. are at present in the United States for the purpose of surveying technical processes for the manufacture of tinplate and similar products. Another representative is in Britain for the same reason. It is understood that the surveying parties' reports will soon be available for study by the directors, and depending upon reasonable assurance of an economic basis, a plant may be constructed at Port Kembla, N.S.W.

## Chemical and Metal Statistics

### National Totals in May and June

**A** STEADY level of production, with some fairly well defined increases in some chemical output, is reflected by the July number of the *Digest of Statistics* (H.M.S.O., 2s. 6d.) dealing principally with manufacture, consumption and stocks in May. Figures for non-ferrous metals show a rather less stable position, with steadily increasing demand and weakening stocks. Employment in the chemical and metal industries—as recorded in the preliminary summary published last week—is steadily increasing, the total of chemical workers in May being 349,600 and of metal workers 3,369,300. (The figures in the following summary represent 000 tons).

#### Sulphuric Acid

The sulphuric acid industry in May produced 115.8 tons, which was the peak of a rising production line starting from February (with 88.2 tons) and showing rises of 13.7 tons in March, 7.6 tons April and 6.3 tons in May, when the total was, however, still below the exceptionally high figure of 117.6 recorded in January. Increased consumption of materials was chiefly of pyrites, of which 16.9 tons were taken up, 2.1 tons more than in April. Use of sulphur actually diminished 0.9 tons to 18.2. Spent oxide required amounted to 15.3 tons (April, 14.7) and consumption of the acid produced rose 3 tons to 118. Acid stocks in May were 0.9 lower at 66.4 tons but the stock position of raw materials was generally stronger, pyrites 89 tons (+1), sulphur 79.2 (+8.6) and spent oxide 145.1 (+2.7).

Production of industrial alcohol showed a reduction in May to 1.77 (million gallons), against 2.26 in April, consumption showed little change at 2.25 and the stock position improved a little at 4.34 (April, 4.20). Rising production was recorded by the molasses industry, the cane production of 7.2 (000 tons) being the highest recorded since October, 1946, and beet molasses was 1.5, against 0.2 in April. The last, however, are "out-of-season" figures bearing no relation to the levels commonly reached in the October-January beet processing season. Consumption of molasses for all purposes was lower in May—for distilling 27.5, against 32.2 in April—and stocks showed the normal reduction for the April-May period from 133.5 to 118.5.

#### Fertilisers

The sharply reduced output by the fertiliser industry is also largely a seasonal matter. Superphosphate total was 87.9 (April, 91.3), and compound fertilisers 118.5 (April, 130.4). Nitrogen content, as an average, was 3.4 higher at 18.9. Consump-

tion showed seasonal reductions: superphosphate 81.8 (April, 112.3) and compounds 158.8 (252.6). Use of ammonia in June was at the exceptionally high level of 31.28 (May, 23.83), a figure which has only once been exceeded in recent years. There was a smaller demand in May for phosphate rock for fertilisers—65.8, against 70.7 in April, but industrial users took up rather larger quantities. Stocks of ammonia and phosphate rock (4.29 and 130.9) were both up, but reserves of fertilisers were reduced, superphosphate to 76.7 and compound fertilisers to 43.1, the latter being by far the lowest quantity in hand for some 12 months.

In the metal industries, steel production in June continued the fairly steady increases recorded in recent months, the total of 254 being 10 higher than in May. Iron ore was 223, against 214 in May and pig-iron 144 (142).

#### Non-Ferrous Metals

Non-ferrous metals as a whole were subject to increased consumption and the stocks in May were generally at a lower level than for many months. Production of virgin aluminium in April (the latest month quoted) was slightly lower at 2.40, magnesium a little better at 0.23. Consumption of aluminium was rather smaller at 12.6 in April and the use of magnesium rose from 0.18 to 0.30. Consumption of other metals was also on a rising scale, as shown by the May figures: virgin copper 32.9 (+4), zinc 19.6 (+0.9), refined lead 15.3 (+1.4) and tin metal 2.70 (+.06). The diminished stocks are represented by the totals in May of: virgin copper 90.8 (April, 97.5), zinc 33.2 (35.8), zinc concentrates 74 (86), refined lead 12.8 (14.8) and tin 15.5 (16.2).

#### Polish Chemical Production

Production figures for Poland's chemical industry during the second quarter of the current year show a marked increase compared with those of the first quarter. The following list (the figures in parenthesis show the percentage increase) has been issued by official Polish sources in London. Coal-tar products (33), benzole (29), sulphuric acid (17), hydrochloric acid (48), ammoniacal soda (10), caustic soda (23), nitrate fertiliser (7), ammonia (16), oil paints and varnishes (8), ultramarine (27), soap (9), washing powder (11), rubber footwear (278), tyres and inner tubes (97).

The great nitrate works of Moscie near Cherzów has resumed production of synthetic ammonia.

# SCIENTIFIC INSTRUMENTS

## Shortages Limit British Industry's Expansion

**M**EANS to secure in the future continued development of the scientific instrument manufacturing industry on the scale of which its performances in two wars have shown it to be capable formed one of the principal themes of the address recently given by Mr. J. E. C. Bailey, president of the Scientific Instrument Manufacturers' Association to the General Committee of the Parliamentary and Scientific Committee.

Noting that the industry seemed to be really valued only in time of war, Mr. Bailey stressed that its value in peace was just as great. They were faced with two major problems. One was to establish the industry's importance in official circles; the other was to overcome the prejudice that still existed. There was still a strong feeling that if an instrument was German it must be better than a British instrument. That illusion was very difficult to overcome.

### Fluctuating Labour Force

In 1910, there were about 10,000 employed in scientific instrument manufacture. At the end of the 1914 war the figure was up to about 22,000, and then gradually reduced. In 1938 there were about 18,000, and that figure was maintained chiefly because of the Key Industries Duty. In the last war employment in the industry went up to 90,000-100,000, but at the end of 1946 they were back to about 65,000.

One of the most pressing problems of the day was the shortage of labour. By the increased use of scientific instruments labour could be made available for more productive work. Large users of instruments, such as Imperial Chemical Industries, Courtaulds, Unilever, etc., had already expressed their deep anxiety about the shortage of instruments.

### Valuable Exports

The industry had a dual rôle to play here in the matter of imports, namely, exporting its own products and helping other industries to develop their research to find new materials and to increase their production generally.

The industry's own exports were especially important because their conversion factor was of the highest kind. The intrinsic value of the raw materials was negligible compared with selling prices. The real exports were the skill and brains of the designer and the craftsmanship of the worker.

Exports in 1938 were £1,300,000 and in 1946 £3,100,000. These hardly reached the Government's target, taking into account a probable 100 per cent increase in price.

New laboratories were going up, being

planned or erected, but it was impossible to specify where the instruments were coming from. There was a great opportunity for this industry to fulfil its functions in the home and overseas market, but they had not been able to impress on the authorities that the scientific instrument industry merited special attention. The industry was largely concentrated around the London area, and the Government were loth to grant building licences. Since the war there had been no general expansion whatsoever.

### German Competition

Skilled workers had been reserved until almost the end of the war, and being last in would be last out. The calling up of young men had interfered with apprenticeships, and that problem had only just been solved. The industry was trying to get priority for materials. It required 5000 tons of steel, and was allocated only one-quarter of that. Yet the industry was the tap that could open the floodgates of other industries.

In Germany, about 90 per cent of the instrument industry had remained intact. They had the plant, machinery and men, but not the material. In this country we had neither plant, machinery, material, nor men. It was not suggested that the German industry should be completely done away with, but there should be some measure of control until the British industry could start level.

There was no control of the German scientific instrument industry. It was allowed to make what it liked. The only slight measure of control was fixing of prices by the new Agency Import Commission. The commission, however, was in danger of competing with the industry here and under-selling.

It had been suggested that the Germans should not make any optical glass since it was potentially a war potential, but the Americans had set up an optical plant in their zone.

### U.S. Competition with German Aid

What would be the effect of the German scientists who had gone to America? It might well be that America would become a serious competitor. In many fields U.S. manufacturers were cutting their prices very much lower than ours.

Mr. Bailey concluded by saying that he was quite confident that the British scientific instrument industry could produce a scientific instrument second to none, and, given the opportunity, would do so.

## An Alkali Inspector Sums Up—II Troublesome Sulphur Compounds

by W. A. DAMON

**S**ULPHURIC acid is produced by both the lead chamber and the contact process. The escapes of sulphur and nitrogen oxides from the former run normally at about 1.5 grains expressed as  $\text{SO}_2$  per cu. ft., although a maximum of 4 grains is allowed by the Act. Provided plants are properly designed, with adequate chamber and tower spaces and with sufficient acid cooling capacity, there is seldom much difficulty.

In order to effect economy in nitric consumption and to avoid the "red flag" characteristic of the discharge of excessive quantities of nitrogen oxide, a time contact of not less than 30 seconds should be allowed for the gas in the packed space of the Gay Lussac. The speed of the gas should be not more than 3 ft. per second. A substantial improvement was effected some time ago by the addition of a tower in which the gases are washed with a small quantity of water between the Gay Lussacs. Not only does this remove excessive  $\text{SO}_2$  and nitre but it tends to stabilise the nitrous gases in the form of  $\text{N}_2\text{O}_3$  which is most readily absorbed by the final Gay Lussac.

Over 50 per cent of the total sulphuric acid is now produced by the contact process in which  $\text{SO}_2$  and  $\text{O}_2$  are catalysed to produce  $\text{SO}_3$ , which is subsequently absorbed in strong sulphuric acid. The efficiency of conversion is dependent on correct temperatures, correct gas mixtures and a catalyst mass in good condition.

Until recently such conversions have not often exceeded 95 per cent and consequently the escape to atmosphere of unconverted  $\text{SO}_2$  was frequently five grains per cu. ft. or more, except in cases where the post absorber gases were scrubbed by ammonia or soda. Lately there have been developments which are likely to bring conversions up to 98 per cent and experiments are also in hand whereby it is hoped to establish more economical methods for the recovery of unconverted  $\text{SO}_2$ .

### Petroleum Works

One of our greatest difficulties lies in the treatment of gases and fumes from the distillation and cracking of petroleum. The offensiveness of these gases is due to the presence of small quantities of hydrogen sulphide and mercaptans. It is usual to collect and pass them through a scrubber in order to remove a light hydrocarbon, after which treatment they are burned under the boilers or stills. The sulphur compounds are thus converted to sulphur dioxide which in low concentration does not normally give rise

to nuisance and is definitely less objectionable than  $\text{H}_2\text{S}$ .

The light gases arising from sour oils during storage also possess an offensive odour and care must be taken to minimise their escape.

Finally the various effluent waters require special means of disposal. It will be realised that to cope effectively with all the possible sources of offence at a large refinery is a most difficult and expensive matter. An elaborate gas collecting system is necessary and the branch mains should all be provided with automatic governors to ensure even and continuous suction at all points.

It cannot be claimed that we have yet achieved 100 per cent success and a large refinery is still likely at times to be an unpleasant neighbour even though it may be honestly employing the best practicable means.

### Chemical Manures

The gases evolved during the decomposition of phosphate rock by mineral acid consist chiefly of  $\text{CO}_2$ , but they contain also varying proportions of  $\text{HF}$ ,  $\text{SiF}_4$  and  $\text{SO}_2$ .

In order to allow for the relatively slow reaction of  $\text{SiF}_4$  with water vapour it is desirable to provide a long flue or delay chamber in which the gases can be wetted and from which deposited  $\text{SiO}_2$  can be readily removed. They must then be subjected to a water wash to effect the removal of acid gases. This is usually done in void towers provided with fine water sprays.

A tower space of 400 cu. ft. per ton of superphosphate made per hour is not excessive and with such provision the escaping gases should possess an acidity of less than the equivalent 0.1 grain of  $\text{SO}_2$  per cu. ft. The washing plant should function with an efficiency of over 98 per cent.

Sulphuretted hydrogen is an unpleasant gas which unfortunately arises from many chemical processes. Normally it is fairly easy to deal with, e.g., by oxide of iron purifiers, Claus kilns, absorption in alkali, etc.

An interesting and useful apparatus for checking the efficient operation of an absorption system is that devised by Robert & Minors.

It depends on a beam of light passing through a lead paper and focused on a photo-electric cell. Decolorisation of the paper by  $\text{H}_2\text{S}$  reduces the intensity of light falling on the cell and causes a warning to be given by lighting a red light or similar means.

An excellent indicator can be provided by the continuous bubbling of a sample of the

washed gas through a solution of sodium nitroprusside. The pale yellow solution becomes pink to violet on combination with  $H_2S$  (depending on the concentration) and the reaction is reversible. It can be adjusted to a sensitivity of 2 p.p.m.

In some cases contamination with organic compounds complicates matters and recourse has to be had to combustion methods.

A major problem is that of the large volumes of vitiated air exhausted from viscose works. Viscose rayon is made by decomposing sodium cellulose xanthate with sulphuric acid. Theoretically this should give rise to cellulose, sodium sulphate and carbon bisulphide, but in practice there are side reactions which result in the production of hydrogen sulphide and mercaptans possessing a most disagreeable smell.

It is of primary importance that the operatives should be protected against any ill effects produced by these gases and the spinning machines must therefore be well draughted. With the ordinary open type of machine this necessitates about 30 cu. ft. per spindle per minute.

The possibility of inhibiting the release of  $H_2S$  from the spinning bath has not been overlooked, but the composition of the spinning bath is of great importance in influencing the quality of the filament and interference with it is regarded with disfavour. At a works producing heavier goods such as capsules and tubes, the method has been used successfully.

### Zinc Problem Unsolved

The fume arising from the production of zinc in horizontal retorts is a great nuisance and no practicable way of curing it has yet been found. A much improved technique of distillation in vertical retorts has been developed and the fumes from this process can be dealt with. The conversion is, however, an exceedingly costly matter and it is beyond the authority of the Alkali Inspector to insist on it.

Sulphur dioxide may be readily absorbed

of course, by alkali, but the market is limited. It may also be absorbed in basic aluminium sulphate, whence it can be removed again in concentrated form by heating.

On the Continent, the sulphidine process is operated. According to this process sulphur dioxide is absorbed by an aqueous solution of toluidine or xyldine and can be recovered by heating.

The removal of sulphur oxides from waste furnace gases is a matter of difficulty and of considerable expense. Experimental work is in hand directed towards the investigation of processes which may be cheaper and of more general applicability than those at present in use.

### Chlorine Precautions

Chlorine is used in a great number of industrial processes and it is obviously necessary that precautions should be taken to prevent its escape to the atmosphere. Absorption in lime or alkali is normally quite easy and satisfactory, provided an alkalinity of not less than 5 per cent is maintained, that there is a good depth of well agitated absorbing liquor and that a temperature of about 70°F. is maintained.

In certain circumstances traces of escaping chlorine may combine with organic substances to produce lachrymatory compounds, the effect of which is more marked than chlorine itself. A case of this sort has recently caused a great deal of trouble, but the difficulties are being gradually overcome.

Tar distillation can be a highly offensive process if due precautions are not taken to deal with the incondensable gases. The normal practice is to draught these gases from the condensate collectors and to inject them below the still fires.

The discharge of pitch unless well cooled is also accompanied by acrid fumes, discharge of which to atmosphere can be prevented by providing either an oil wash or causing the fume to pass through a baffled chamber in which the particles coalesce and are deposited.

### Exemptions from Duty

The Treasury announces that it has made an Order under Section 10 of the Finance Act, 1926, exempting the following chemicals from Key Industry Duty for the period August 13 to December 31, 1947:—

Formic acid (strength not less than 98 per cent by weight), dicyandiamide, ethyl orthoformate, ethyl phenyl-ketone (propionophenone), and succinic anhydride.

The Order, "The Safeguarding of Industries (Exemption) (No. 4) Order 1947" (S.R. & O. 1947, No. 1680), is obtainable from H.M.S.O., price 1d.

### New B.S. Specification

A new British standard issued by the B.S.I. for reinforced diamond dies represents the first attempt at any specification in this field, and relates to those with bores up to 0.06 in. diameter. It indicates the desirable characteristics of the stone and defines the appropriate minimum wall thickness and minimum weights for various bores. Copies of the specification B.S. No. 1393 (1947) are obtainable from the British Standards Institution, 28 Victoria Street, S.W.1.

## BRITISH ROCKET STATION

### Role of Hydrogen Peroxide

ALTHOUGH British work on rocket propulsion is still secret, journalists who were invited to the new rocket research station at Westcott, Bucks., on Wednesday of last week, were able to see how far the Germans had advanced in the rocket field and the different fuels and oxidants they used. Whatever British experiments were going on had been carefully put to one side for this visit, so that a one-sided impression may have been obtained.

The head of the station, Dr. W. R. Cook, explained that Westcott had been selected as the central experimental establishment for all applications of rocket propulsion, although practical tests in the air will be carried out at other stations, e.g., in Australia. The establishment is sub-divided into sections dealing with research and development on combustion chambers; the methods of fuel supplies (ranging from compressed gas to pumps and turbines); combustion kinetics; heat transfer; and special materials. He mentioned that although the Germans did a lot of pioneer work, the study of rocket propulsion is still in its infancy, and there is much work to be done on the most efficient types of fuels and oxidants, and the metals to be used for the combustion chambers.

The number of British workers who will eventually be at Westcott is not known, but there are at present 12 German scientists who were previously working on rocket work in Germany.

### Fuel Feed Problem

One of the problems in rocket propulsion is that of getting large quantities of fuel into the combustion chamber. For this purpose steam produced in various ways is used to drive turbines which pump the fuel. For fuel a single substance can be used, or a fuel and an oxidising agent. The principal oxidising agents used are liquid oxygen, concentrated hydrogen peroxide and nitric acid.

Hydrogen peroxide is the only substance which has been used as a mono-propellant. It decomposes catalytically with liquid sodium or potassium permanganate to produce superheated steam and oxygen. This steam was used to drive the turbines of the V-2. Catalytic stones, composed of cement and permanganates, which will decompose a thousand times their weight of  $H_2O_2$ , can also be used. At first this reaction is a chemical reaction, but subsequently it becomes a catalytic reaction. Hydrogen peroxide has also been used with various fuels as the main oxidising agent, e.g., with methyl alcohol, hydrazine hydrate and a catalyst of potassium cupro-cyanide. It can be used with paraffin, but ignition has to come from an outside source.

(Continued at foot of next col.)

## COAL STOCKS IN N.W.

### Better than Year Ago

COAL stocks are being slowly built up by hundreds of firms in the North-West in an effort to avoid a repetition of last winter's fuel crisis. Many have accumulated a three weeks' supply—a much better position than a year ago. This has been possible only by the most stringent economies with summer supplies. Fuel quotas—very much reduced from normal—have not been fully met this summer, and it has been an arduous task to try and put stocks away for winter. Conversion from coal to oil burning has helped to spread out fuel supplies to others dependent entirely on coal. Pilkington Brothers, the St. Helens glass firm, have recently turned over much of their plant to oil burning. Generating plant has been installed in many Lancashire and Cheshire engineering works. Among coal stock reports from North-West firms are: W. T. Glover's, electric cables, Trafford Park, employing 1100—three weeks' reserves, much better than a year ago; Clayton Aniline, chemicals and dyes, employing 1700—at least two weeks' reserves; Renold and Coventry, chain makers, Heaton Mersey, employing 3000—close on 21 days' reserves; Linotype and Machinery, Ltd., Broadheath—ten days' reserves.

## COAL BORING

AN application by the National Coal Board for permission to begin boring operations in the Wrexham area has caused speculation regarding the possibilities of a modern colliery being opened. The Coal Board, it is understood, is to begin boring operations near Whitegate factory, and in the direction of Marchwiel where one bore hole already exists. Plant for the operations has already been secured and as soon as arrangements have been made for the discharge of the effluent, preliminary arrangements will be made for setting up the machinery. In view of recent statements that there was no immediate prospects of reopening some of the old collieries in the area because the shafts were not suitable for modern methods, there is a belief that if the new borings prove successful, new shafts will be sunk on the south side of Wrexham which will embody the latest British and Continental ideas in mining technique.

Among the demonstrations shown to the visitors were experiments with the various fuels, the 4 cwt. motor of the German rocket fighter in operation using 2 gal. per second of hydrogen peroxide, hydrazine hydrate and methyl alcohol, and an assisted take-off unit.

## I.C.I. HAS A SIX-YEAR PLAN

**N**EW railway lines and roads, more engineering workshops and a works housing scheme are included in the expansion plans of Imperial Chemical Industries, Ltd. (Alkali Division), Northwich, for the Winnington and Wallerscote works. Probable date for completion of the scheme, which it is estimated will cost several million pounds, is given as 1953.

Mr. W. M. Inman, chairman of the Alkali Division, said that the demand for alkali was continually increasing and it was essential production should keep pace with demand, not only for home needs, but because of the vital need for increasing Britain's exports. "Considerable extensions are already being carried out within the works area," he said, "but a further programme of extensions is being considered which would involve not only a large-scale reorganisation within the works, but also breaking new ground outside the present boundary."

Proposals for extending the Winnington and Wallerscote works were outlined by Mr. G. A. Begg, chief engineer. Present rail facilities to and from the works must be increased, either by doubling the present line from Hartford and Greenbank to Winnington works, or by constructing a new line connecting the C.L.C. with the L.M.S. between Hartford and Acton Bridge. These alterations were being considered by the railway authorities, who, it was expected, would carry out the work. "A major item of new construction which would be required outside the present works would be new engineering workshops," said Mr. Begg. "A possible site for these, together with garage accommodation and additional stocking ground for new materials, is on the land at present known as Jubilee fields." The plans would necessitate various alterations in the layout of roads in the area, and the provision of new playing fields.

## BRAZIL IMPORT LICENCES

The following commodities may now be imported into Brazil without the need for obtaining a prior import licence: Resin, turpentine, oil of pine including its products and derivatives, tar and pitch of vegetable origin, lac and shellac, nux vomica, cellulose-sulphite and sulphate, bleached or otherwise, abraeives—natural or artificial, petroleum and its derivatives, carbon and graphite electrodes, sulphur, cryolite, copper, brass, bronze, lead, nickel, tin and zinc, chemical products for industrial, medicinal and pharmaceutical use, and fertilisers.

## NON-FERROUS METALS

**D**ETAILED figures of consumption of non-ferrous metals in the U.K. during the second quarter of 1947, relating to zinc, lead, tin, cadmium and antimony, have been issued by the Directorate of Non-Ferrous Metals. The attached table shows consumption of virgin metals and scrap for the various trades. Total figures of the consumption of virgin metal only, including, for comparison, the year 1946 and first quarter of 1947 are as follows:—

	Year	First quarter	Second quarter
	Tons	Tons	Tons
Zinc	216,089	48,701	57,946
Lead	193,506	42,535	40,237
Tin	25,606	6,663	6,857
Cadmium	542	122	130
Antimony	5,623	1,160	1,317

Principal consumption of zinc was by the brass manufacturing industry, which took in the first quarter of this year 24,415 tons and in the second quarter 28,377 tons. The next largest users were galvanisers, with 17,770 and 19,109 tons, followed by the zinc oxide industry—11,710 tons and 13,634 tons.

The main users of imported and scrap lead were cable manufacturers (20,961 and 23,139 tons) and sheet and pipe manufacturers (17,860 and 21,453 tons). The manufacture of alloys absorbed the largest proportion of the total tin allocation to trades, using in the first quarter 3485 tons and in the second 3434. Other principal users were tinplate, 2074 and 2210 tons; and solder, 1552 and 1325 tons.

Plating (52 and 61 tons) and colours (dental and glass, 40 and 29 tons) absorbed most of the industrial allocation of cadmium; antimony was distributed principally to oxides and compounds (498 and 656 tons), antimonial lead (255 and 176 tons) and bearings (158 and 156 tons).

### Zinc Consumption

According to statistics prepared by the Directorate of Non-Ferrous Metals, 82,301 long tons of zinc were consumed in the United Kingdom during the second quarter of this year compared with 69,436 tons in the first quarter. Lead consumption amounted to 76,303 (70,860 first quarter) of which 40,237 were imported. 8657 tons of tin were used (8463), cadmium 130 tons (122), and antimony metal and compounds 1317 (1160).

**Change of Address.**—Aluminium Union Limited announces that it has now returned to The Adelphi, Strand, W.C.2 (TEMPLE BAR 3535) where all communications should now be addressed.

# RADIOACTIVE ISOTOPES

## WIDESPREAD USES—TRANSPORT DIFFICULTIES

**A**LTHOUGH it was only just over a year ago that the first sale was made of a beneficial radioactive isotope produced from the uranium chain-reacting pile of the Monsanto Company's Clinton Laboratories, to-day more than 100 varieties of radioisotopes are in production at these laboratories. The Atomic Energy Commission reports that in the first year of production Clinton Laboratories has made 1092 shipments of radioactive elements. These have been made to scientific and industrial research institutions throughout the continental United States and the territory of Hawaii.

The 1000th shipment was made on July 9. It was a unit of phosphorus 32 consigned to the U.S. Public Health Service at Washington to be used for fundamental biological research in disease control.

The isotope production and distribution programme, which was set up under the Manhattan District of the U.S. Army Corps of Engineers, has been carried forward under the Atomic Energy Commission. Requests for the radioisotopes are reviewed and approved by a special Allocations Committee and distribution is supervised by Dr. Paul C. Aebersold, chief of the Isotope Branch of the Commission. Isotope research and production has been co-ordinated at Clinton Laboratories by Dr. Edgar J. Murphy, assistant research director.

Before the chain-reacting pile was available, most artificially produced radioisotopes were made in cyclotrons. The cyclotron, however, was capable of producing only limited quantities of radioactive materials. An example of this is seen in the estimated cost of cyclotron-produced C 14 of \$1,000,000 per millicurie against the present price of \$50 for the same amount manufactured in the pile.

### Advantages of Isotopes

The tremendous advantage of the radioisotopes lies in the fact that while they are chemically identical with the stable forms of the elements, they are radioactive and their radioactivity can be detected. Thus, a minute quantity of one of these isotopes can be followed through complicated chemical reactions through the metabolic process in the body, through entire biological cycles or through any other physical or chemical processes and still be identified. Dilutions or chemical changes of the tracer isotope make no difference. The radioactivity will still register on a Geiger counter or show its course on photographic film. The atoms are

tagged for as long as the radioactivity lasts.

The rate at which radioactive materials undergo transformation is measured by time intervals called the half-life. At the end of the first half-life period the amount of radioactivity is half the original amount. In the next half-life interval, half the remaining activity—or one-fourth the original amount—remains. The half-life of different materials varies widely. For uranium 238, it is 4.5 billion years; for carbon 14, it is 5100 years, and for radium, 1590 years. Radiogold has a half-life of 2.7 days. Radioactive potassium has a half-life of 12.4 hours and a special isotope of polonium has a half-life of approximately one-millionth of a second.

### Production and Transport

Production of radioisotopes at Clinton Laboratories was made possible only after considerable research. Overall administration has been in charge of Dr. Charles A. Thomas, technical director of Monsanto Chemical Company. Thomas, who was a member of the five-man committee which prepared the Acheson-Lilienthal Report on the International Control of Atomic Energy for the State Department, also took an active part in the development of the atomic bomb.

Radioisotopes are distributed for scientific research only upon request. Allocation of the materials by the Isotopes Branch is based upon the Advisory Committee's recommendations and considers such matters as the requestor's facilities, nature of research and whether or not results of the work will be made public. Priority is given to those institutions performing work of a purely scientific nature which can be made available to other researchers.

Transportation of these radioactive materials presents difficulties as special containers have to be used for them. These containers range in weight from less than a pound to a ton. The amount of shielding varies with the amount and energy of radiation. The average container, such as used for shipping the radioisotope of iodine (I 131), weighs between 100 and 150 lb. The thickness of lead shielding is from  $\frac{1}{2}$  in., depending upon the amount shipped.

The radioactive material is first placed in a glass bottle which is inserted in an airtight stainless steel cylinder. The cylinder, in turn, is placed inside a lead shield which is supported firmly inside a strong wooden box. Complete directions for opening the lead shield are placed inside the box which is then sealed for shipment. The box is finally checked with sensitive radiation

instruments to determine the amount of radiation at the surface. Should this prove to be above tolerance, the substance is repacked with a thicker shield.

Although during the past year radioactive substances have been shipped more than 700,000 miles by regularly scheduled airlines, some airlines still refuse to handle the radioisotopes. They mistakenly fear the radioactivity will affect navigation instruments, such as radio and compass, or items of transport. The scientists at Clinton, however, state that the radiation intensity at the surface of an isotope container is approximately the same as that at the radium dial of the pilot's wrist watch.

### Radioactive Cobalt

Perhaps one of the largest and most interesting shipments of radioactive material under this programme was in February, 1947, when a 23-gram unit containing radioactive cobalt (Co 60) was shipped to the Bureau of Standards in Washington. The container, shielding the cobalt oxide which was equivalent in weight to a 50 cent piece, weighed 1600 lb. This isotope, which has a half-life of 5.3 years, is being used by the Bureau to furnish radiation standards to research workers for calibration of radiation measuring instruments.

Some of the most important radioisotopes for fundamental research in medicine have especially short half-lives. These include radiogold (2.7 days), radiopotassium (12.4 hours), radiosodium (14.8 hours), radioiodine (8 days) and radiophosphorus (14 days).

Shipments of these materials are handled as expeditiously as possible. When an order has been processed and a shipping date set, prior arrangements relative to shipment are made with an airlines agency and the shipment—after being properly packaged—is sent by fast truck to the airport just before flight time. Simultaneously, the customer is notified of the departure time and advised to meet the plane at its destination and arrange for prompt delivery.

Radioactive materials emit only gamma and beta rays and alpha particles which have no effect upon radios or aircraft instruments. Lead shielding of materials emitting gamma rays will afford very adequate protection of personnel and undeveloped film from this radiation. No commodity or merchandise other than undeveloped film can be affected by proximity to the radioactive material as shipped.

Although radioisotopes have important uses as therapeutic agents in the treatment of certain diseases, their most important single contribution to mankind is as a research tool. The value of isotopes in research has been compared to the utility

of the microscope. Thus as the microscope opened new fields of scientific endeavour, so will radioisotopes further expand the vista of fundamental knowledge.

The tracer technique, by virtue of the infinitesimally small amounts of chemicals which can be detected through their radioactivity, will enable researchers to study many physical, chemical and biological phenomena which heretofore have remained unsolved.

In a recent address, Dr. Thomas cited the great value of radioisotopes in fundamental research in the field of pure chemistry. He said their use is an important aid in studying the mechanism of organic reactions. "Already," he added, "experiments using radioactive elements have given an insight into many difficult chemical problems."

During the year, shipments have gone to approximately 170 institutions and researchers scattered throughout the country, and approximately 100 varieties of radioisotopes have been made from around 60 elements.

Among them was radiophosphorus and radioiron for agricultural studies, radiophosphorus and radioiodine for medical research and treatment, radiosodium, radiopotassium and radiomercury for investigations in human physiology and heart disease, special pile irradiated steel bearings for applied research on friction problems in industry, and radiocarbon, radiosulphur and radiopotassium for fundamental research on disease control.

### Molecular Layer Investigation

Investigations on basic chemical processes are being conducted at the University of Wisconsin. Studies have begun of the nearly weightless layers of foreign molecules and ions (charged atoms or groups of atoms) which attach themselves to glass and metal surfaces. From these investigations of the factors involved in the formation of such layers, a better understanding of chemical forces at the surface is being obtained. Such information may be of practical usefulness in the fields of catalytic action, electroplating, mirror formation and detergent action.

The use of radiochlorine, radioactive bromine and iodine in studying the exchange reactions of these elements with molecules containing the same elements is also reported. In other words, do the chlorine atoms of sodium chloride interchange with chlorine atoms in certain more complex molecules? It would be impossible to observe such reactions without the radioactively tagged atoms. The reasons for this study are to attempt to understand the mechanism of complex chemical reactions.

Among the industrial aspects of the work

are experiments in friction. Steel that has been made radioactive in the pile is being used to determine what happens to metal during friction and wear. The active specimens will be employed in experiments on dry and lubricated friction phenomena to investigate the rôle that material transfer plays in these phenomena, and it will also be employed in research at the Massachusetts Institute of Technology to investigate the surface of layers developed on the piston rings and cylinder walls of well run-in aircraft engines. Tests at the Massachusetts Institute of Technology have shown that the tracer method makes it possible to detect as little as one hundred-billionth of an ounce of metal transferred from one surface to another by friction. This sensitivity is thousands of times greater than that of previous methods. Such studies of the exchange between sliding surfaces is of extreme importance in understanding friction. It may lead to important advances in the treatment and composition of surfaces to

reduce frictional wear in all types of machinery.

Metallurgists also are finding many uses for radioactive tracers. They are studying such diversified problems as the aging of ferrous materials by following the diffusion of carbon atoms, the thermionic activity of filaments, and the absorption of gases in metals. Other fundamental problems confronting the research metallurgist which can be solved by radioactive tracers are related to oxidation, diffusion, vapour pressures and the kinetics of reaction in solid alloys, such as age hardening, quenching, annealing and homogeneity of powder mixtures.

One of the major processes to be developed by the steel industry is a controlled method for removing sulphur from iron when the iron is separated from the slag. Before this can be accomplished, the mechanism by which sulphur is distributed between slag and metal must be understood. Metallurgists are now in a position to study the reaction, since radioactive iron and sulphur tracers can be introduced into the process.

## ISOTOPE SEPARATION BY COUNTER-CURRENT METHODS

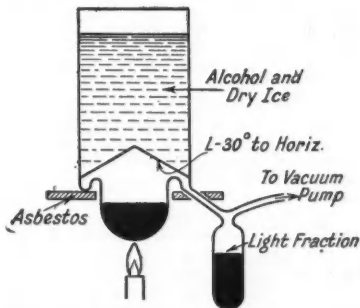
**I**N connection with work on the natural isotopes of potassium and chlorine, new methods for isotope separation by counter-current techniques have been developed at the U.S. National Bureau of Standards. One method using counter-current electromigration makes use of the difference in the ionic mobilities of the isotopes of an element and has been developed to a point where it can be used as a practical means of separating not only isotopes, but ionic species in general.

The natural isotopes of potassium and chlorine have been efficiently concentrated by counter-current electromigration, and it is expected that further research will result in techniques for the concentration of the isotopes of other elements, including silver and copper, by this method. Counter-current electromigration has been suggested as a means of separation of like elements, such as the rare earths, whose chemical properties are so similar that an elaborate procedure involving thousands of fractional crystallisations has been required for separation.

It had long been suspected that isotopic ions of a given element in solution might differ in their migration velocities, the lighter isotope having a slightly faster rate of migration than the heavier. Lack of suitable techniques had prevented demonstration of the reality of this effect until the need of a simple, easily controlled method of isotope separation resulted in the counter-

current electromigration. The entire process takes place within an electrolytic cell containing anode, cathode, and suitable electrolyte. The basic principle of operation of the method rests in an imposed flow of electrolyte through the solution in a direction opposite to the migration of the ions to be separated. If the rate of flow of the electrolytic counter-current is made equal and opposite to the average rate of an ion transport, then only the lighter isotopic ions will make headway against the current, while the ions of the heavier isotope are carried in the opposite direction.

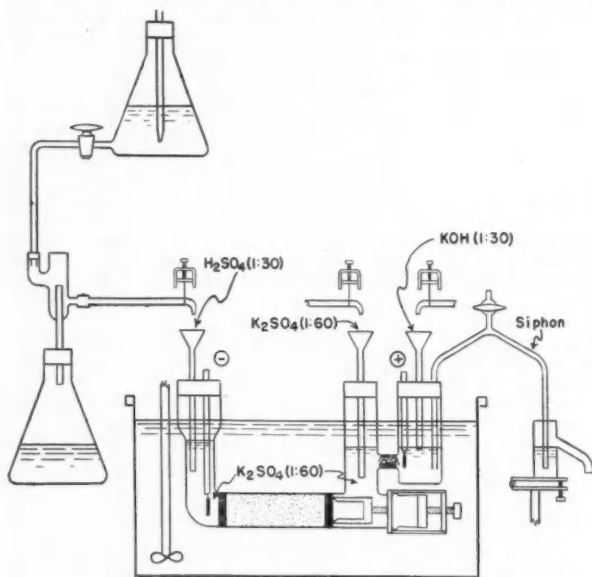
The process was first used in the separation of the isotopes of potassium. A



A single-stage still

U-shaped electrolytic cell consisting of vertical anode and cathode compartments separated by a horizontal tube packed with 100-mesh sand was constructed, the anode compartment connecting by means of a siphon to a constant-level spillover. Platinum electrodes were placed so as to provide a uniform potential distribution across the

cathode. The net transport of potassium ion is thus reduced to zero as the lighter  $K^{39}$  ions make headway against the electrolytic stream while the heavier  $K^{41}$  ions are washed back. The packing thus behaves as a fractionating column under total reflux and  $K^{39}$  is concentrated in the cathode compartment. Since the anode compartment is



**Diagram of equipment for the separation of natural isotopes of potassium by counter-current electro-migration. Numbers in brackets express solution concentrations as equivalent ratios of solute to water.**

packing. Before starting the run, the cell is filled with an electrolyte, such as  $K_2SO_4$ , to the desired level as determined by the height of the spillover. When the current is turned on,  $K^+$  ions migrate toward the cathode compartment, while  $SO_4$  ions migrate to the anode. An electrolyte stream flow is induced in the cathode-to-anode direction by slowly adding more liquid to both cathode and anode compartments, the excess being automatically siphoned off at the anode. In practice a solution of  $H_2SO_4$  is added to the cathode compartment and  $KOH$  to the anode compartment. These are known as restituent liquids, since they act to restore the original chemical composition of the electrolyte in the cell. It was discovered that when the concentration and rates of addition of both restituent solutions are such that the concentration and pH of the electrolyte throughout the cell remain constant during the run, the flow of electrolyte through the packing (a fine-grained packing of uniform porosity) is just equal to the average rate of progress of potassium ions toward the

constantly being supplied with  $KOH$ , the  $K^{39}$  concentration remains at its normal value. As a result, this compartment serves as a constant supply reservoir. The point balance between ion migration and stream flow is confined to the uniform porous packing separating the cathode and anode compartments.

In the work on concentration of the light potassium isotope, the ratio  $K^{39}/K^{41}$  was increased from 14.2 in ordinary potassium to 24 in the concentrate in 449 hours. An extension of this procedure has been found practical for the simultaneous concentration of both  $K^{39}$  and  $K^{41}$  in cathode and anode compartments respectively, and is expected to prove useful for further isotopic concentration of small amounts of enriched potassium salts.

The chlorine isotopes  $Cl^{35}$  and  $Cl^{37}$  have been separated by a similar procedure with certain modifications. When  $NaCl$  solution is used as an electrolyte and  $NaOH$  and  $HCl$  as restituent liquids at anode and cathode respectively,  $Cl^{35}$  can be concen-

trated in the anode compartment provided the original isotopic ratio is maintained in the cathode compartment. However, if the chloride ion is allowed to react at the anode to form chlorine gas, it will escape, thus changing the relative proportions of chloride isotopic ions. To prevent such a reaction, a solution of NaOH was interposed around the anode to form a boundary between the chloride and hydroxide solutions. Since it was necessary to use a NaOH solution of greater density than the NaCl solution used, a goose-neck anode compartment was designed so that the alkali solution might be the lower layer at the anode boundary. In this work the ratio  $\text{Cl}^{35}/\text{Cl}^{37}$  was increased in the light concentrate from 3.12 to 4.18 in 474 hours.

### Advantages Over Other Methods

The counter-current electromigration method has several inherent advantages over alternative methods of isotope separation that have been used in recent years. The simplicity of the apparatus, both in construction and operation, is perhaps its most important feature. Isotopic separation takes place in a single step without the need of a vacuum system or other elaborate accessories. The system requires very little attention, and with the use of automatic controls for addition of reagent liquids it becomes entirely self-regulating. The use of a very fine, uniform porous packing provides a much higher reflux efficiency per unit length than may be achieved by other fractionation methods of isotope separation. Hence, the assembly has the advantage of requiring a minimum of space for the results accomplished. The process has the added convenience of being well adapted to use with many elements which may easily be obtained in ionic solutions.

Other research has resulted in a new and highly efficient type of counter-current reflux molecular still for the separation of natural isotopes. It has proved to be an effective instrument for the separation of the natural isotopes of mercury, and is expected to have application to isotope work on other elements. Plans are being made for the application of this type of apparatus to the separation of pure hydrocarbons from petroleum and the isolation of vitamins from animal and vegetable products.

The term molecular distillation has been applied to that type of distillation where there is no return of escaping molecules to the evaporating surface. This is accomplished by operating with high-boiling (low vapour-pressure) liquids under such high vacuum that the mean free path of the escaping molecules is of the order of the distance between the surface of the evaporating liquid and the cooled condensing surface of the still. In molecular distillation, the

relative rates of escape of the various types of molecules from a composite liquid surface are determined by two factors: (1) the vapour pressure (boiling point) of each component, and (2) the average molecular velocity of each component. Vapour-pressure differences among the isotopes of the heavy elements are small or non-existent, whereas molecular velocities, at a given temperature, are inversely proportional to the square roots of the atomic weights. Molecular distillation thus offers a very practical means not only for separation of the isotopes of the heavier elements, but also for the separation of any mixture of high-boiling substances differing in molecular or atomic weight. The latter application is particularly useful in the separation of hydrocarbons that do not differ appreciably in boiling point or are unable to withstand the high temperatures of ordinary distillation.

Previously, in order to obtain appreciable concentration of mercury isotopes, using small single-stage molecular stills, it was necessary to repeat the separation process many times, requiring an elaborate system for collecting, recombining and distilling fractions. To overcome these difficulties, a

(Continued on page 266)

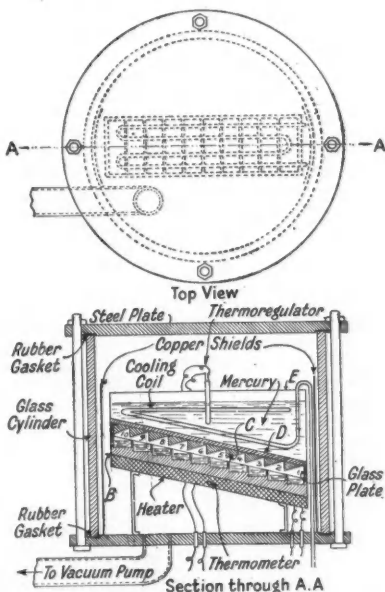


Diagram of 10-cell cascade system for separation of isotopes by counter-current reflux molecular distillation

## U.S. CHEMICAL EXPORTS

CHEMICAL exports from the United States in 1947 may reach an all-time record total of \$700,000,000 if shipments continue at the rate prevailing during the first quarter of the year, reports the American Chemical Society. This total would represent an increase of 40 per cent over 1946 and would be more than four times the figure for the last pre-war year. The tremendous rise in dollar volume, however, does not necessarily reflect a similar expansion in tonnage shipments since prices also have gone up in the last year.

The foreign demand for American chemicals has been principally for coal-tar products and medicinal chemicals, which have shown a seven-fold increase in export volume since 1939. One reason for this development is that importers of American goods are running short of dollar credits, and therefore tend to purchase only materials which can be used in the manufacture of exportable goods and necessities not available at home. Another factor contributing to America's position as the world's leading supplier of chemicals is the fact that she has fallen heir to many of Germany's former markets with the result that a ten-fold increase has been noted in the demand for American dyes since 1939. This has caused the export total for coal-tar products to soar, despite shortages of benzene and phenol.

Belgium imported \$2,809,000 worth of coal-tar products from the United States last year, thus doubling her 1939 purchases, while France increased her imports five-fold, although her dye output is down to about half the pre-war level. Switzerland, now an established exporter of dyes, imported American coal-tar products worth \$4,093,000 in 1946 as compared with \$80,000 worth in 1939, when Germany was her principal source of supply. India, whose imports of American coal-tar products were negligible in 1939, in 1946 made purchases totalling \$8,282,000. South American republics formerly largely dependent on Germany, increased imports from the United States five-fold to \$7,368,000, while Canada, a steady customer of the United States, bought \$7,500,000—twice her 1939 volume.

Although the world-wide shortage of dollars is the principal factor limiting United States export trade in chemicals, import restrictions in foreign countries and two-way reciprocal trade pacts between European nations are also said to constitute obstacles. Furthermore, increased production in the British and United States zones of Germany may soon offer United States chemicals and drugs some competition.

## GERMAN OIL FIELDS

THE recent Dutch claims on German territory adjoining the border has attracted attention to the oil resources in the disputed area. In December the production of the fields in the area of the Ems-river averaged 53,000 tons a month. By March of this year, however, the figure had gone down to 39,000 tons. The three "Emsland" bore-holes of the Wintershall and Elwerath companies yielded last year 79,870 tons. The Fuhrlerg-Hambühren district, operated by Wintershall and Brigitta-Companies, produced 51,000 tons. At Wietze where the oil is mined output reached 22,116 tons.

The following companies participated in the production of oil in Western Germany: Deutsche Vacuum Oil A.G., in Hamburg (U.S.-owned); Gewerkschaft Brigitta (Shell & Standard Oil); Preussische Bergwerks A.G.; "Preussag," Schachtbau-G.m.b.H. at Salzgitter and Braunschweig G.m.b.H., formerly State-owned enterprises; C. Deilmann G.m.b.H., Bentheim, Deutsche Erdöl A.G., "Dea" Wintershall A.G., Celle, Itag A.G., Celle; Siep & Co., Cologne; Ritz & Co., Hamburg; Wietze-Gewerkschaft Elwerath, Hanover (all privately owned).

*(Continued from p. 265)*

new type of molecular still was designed in which a number of single-stage stills were so connected that recombination of fractions takes place automatically by gravity feed. In this way a separation that would have required 55 individual and recombination distillations was obtained in one step with a 10-compartment still, while the quantity of mercury required was enormously reduced.

The multistage molecular still consists of a series of evaporating surfaces, or pools, set adjacent to each other, but at slightly different levels. A cooled roof directly above each pool serves to condense the vapour. The roofs are so sloped that the condensate will run along the surface to fall into the adjacent cell higher up. Each pool is equipped with a spillover, which allows liquid to run back in amount equal to the condensed vapour carried forward. The overall operation is such that the light fraction increases in concentration toward the upper end, while the heavy fraction increases in concentration toward the lower end of the still.

Apart from a great saving in time, labour and materials through use of this still, the operation can be made continuous; the material to be concentrated can be fed into the system at one end or at the midpoint, if both light and heavy fractions are of interest; and the concentrate can be withdrawn continuously and the entire operation can be run without exposing the material to the atmosphere.

# THE ROYAL INSTITUTION\*

## Contributions in the Physical Chemistry Field

by PROFESSOR ERIC K. RIDEAL, D.Sc., F.R.S.

**I**N celebration of the centenary of The Chemical Society, I was asked whether I would give a lecture under the somewhat formidable title of "The work of the Royal Institution in Physical Chemistry in Great Britain." According to the statutes, the Royal Institution is a foundation "for the promotion of science and the diffusion and extension of useful knowledge." It is best known throughout the world as the place where Michael Faraday lived and worked. It was, indeed, Faraday who imparted to the Institution its peculiar characteristics which combine those of an academy, a club and a research institution.

### Distinguished Figures

Research in chemical matters in the Royal Institution may be said to have commenced with the appointment of Humphrey Davy in 1801 as lecturer in chemistry, and shortly afterwards as Professor, the first of the Resident Professors. Faraday was appointed first Fullerton Professor of Chemistry in 1833 and had as his successors in this Chair Odling, of Oxford (1868), Gladstone (1874), Sir James Dewar (1877), Sir William Bragg (1923), and Sir Henry Dale (1942).

Other Professors of Chemistry have been W. T. Brande and Sir Edward Frankland, while the Professors of Natural Philosophy who have extended our knowledge of physical chemistry by experimental work in the Institution include Thomas Young, John Tyndall and Lord Rayleigh. No less than five of the Professors in the Royal Institution have been Presidents of the Chemical Society.

It is evident that many lectures would be required to encompass the contributions to science of Michael Faraday alone, while those of both Davy and Dewar were remarkably extensive. I cannot do more than point out some of the more important physico-chemical investigations which have interested a number of workers, including not only the professors I have mentioned, but others who came to work in the laboratory.

It is, for example, interesting to note that the founder of the Royal Institution, that remarkable American Benjamin Thompson, afterwards Count Rumford, included in his investigations not only the mechanical equivalent to heat, but also the principles of thermal isolation and of reflection and radiation of heat. Sir Humphrey Davy

published a number of papers on radiant heat and Thomas Young, who was Professor of Natural Philosophy at the time, developed the undulatory theory of light and interpreted the phenomena of optical interference. Later, Tyndall in his study of the diathermancy of gases and vapours contributed much to our knowledge of the infra-red and to the scattering of light by particulate matter, and, as is well known, Lord Rayleigh's Interferometer is now one of the most important of our physico-chemical instruments.

The Rayleigh laws of light-scattering are now being applied to the determination of the size and shape of disperse matter, especially polymers. This work on radiation was followed by that of Sir Joseph Petavel on the measurement of the intensity of radiation at high temperatures, the determination of the melting point of platinum and the development of the bolometer.

### Liquefaction of Gases

Another interesting case of continuity of work is to be found in connection with the phenomenon of condensation and liquefaction, starting with Davy's interest in this problem which resulted, as we well know, in the liquefaction of chlorine by Faraday, who subsequently succeeded with other condensable vapours and gases. Faraday failed to liquefy the more permanent gases, but this work was taken up with great success by Sir James Dewar. It must be pointed out that Dewar's work on low temperatures included the determination of specific heats at low temperatures, the absorption of gases by cool charcoal and other absorbents, and the principles of thermal isolation, all of which have had important consequences. It is not clear whether Dewar was the first to make use of the hot-cold tube method used so successfully by his contemporary St. Clair Deville and afterwards by Neunst and Wartenburg, but he describes the thermal formation of ozone by this method.

The work of Davy on Electrochemical decomposition, which founded the modern electrochemical industries, was, as we know, followed by the quantitative work of Faraday, resulting in the fundamental laws of electrolysis. Dewar contributed work on the reactions in the electric arcs and in the silent electric discharge. His work on nitrogen fixation in the form of hydrocyanic acid and cyanogen is worthy of note.

It was in the Royal Institution that Rayleigh's classical investigation on the

\* From a lecture given during the celebration of the Chemical Society's Centenary.

densities of gases and isolation of argon was carried out. The thermal formation of nitric oxide was not the least important part of this work. Cuthbertson's determination of the refractivities of the rare gases and Wahl's optical investigations on solidified gases were likewise carried out there. Davy's work on fire damp, resulting in the miner's lamp, finds application to-day in the construction of explosion barriers. It is also worth recording that Davy made the first photographic (profile) prints.

#### 40 Years of Faraday

Faraday's active experimental life extended over a period of some forty years and during that period no less than fifteen major investigations were undertaken, each of them having a profound effect on physical chemistry as we know it to-day. It is worth setting these down. They were: 1820, alloys of steel; 1821, electromagnetism, magnetic rotation; 1823, liquefaction of  $\text{Cl}_2$  and other gases; 1825-6, isolation, analysis and sulphonation of benzene and naphthalene; 1825-9, optical and heavy glass; 1831, vibrating surfaces and magneto electricity; 1834, electrochemical laws, electricity in the Voltaic pile and catalysis; 1837, frictional electricity, specific inductive capacities; 1845, magnetism; 1849, diamagnetism and light, magnetism of flame and gases; 1851, colloidal gold; 1860, regelation of ice.

It is quite probable that Tyndall, when studying the moulding and flow of ice, had Faraday's work in mind. Tyndall's work on glacier movement forms the basis of the modern treatment of this subject, and Barnes extended our knowledge of the crystal structure of ice in the same laboratories. We must also note that Dewar was interested in the flow of substances under pressure, but made no notable contribution to the subject, except to record the effect of high hydraulic pressures on many chemical substances.

Gladstone made a number of important contributions to our science. His early work consisted in evaluating the molecular refractions of a number of compounds from which he, together with the Rev. Dale, defined the concept of atomic refraction and compiled the first table of this physico-chemical property.

He likewise, in his development of this well-known zinc-copper couple, made a number of important observations such as that there is scarcely any liberation of hydrogen when magnesium is brought into contact with pure water, but on addition of a trace of a copper salt, a vigorous reaction sets in. He published a number of illuminating drawings of the form of silver crystals growing from silver nitrate to which copper had been added, and of tin growing from stannous chloride in the presence of zinc. He

showed, furthermore, that the zinc-copper couple would not only decompose water, but also the organic halides, and describes zinc ethyl as spontaneously inflammable.

Dewar carried out a series of experiments which at that time were important in establishing the principles of reversibility. Together with Scott, he determined the vapour densities of sodium and potassium and the vapour densities and dissociation of hydrazine hydrate and mercuric cyanide.

W. J. Russell worked on the theory of the photographic plate within the walls of the Davy-Faraday laboratory, his Bakerian lecture of 1898 was devoted to this subject. It is significant that Clerk Maxwell in a "Friday Evening Discourse" in 1861, adopting Young's theory of colour vision, showed the first three colour photographs of a piece of ribbon; this formed the basis of the three-colour process. Other early workers in physical chemistry include Sidney Young on fractionation, George Senter on electrolysis and hydrolysis rates, Wildermann on photo-voltaic effects, and Tizzard on hydrolysis.

If the determination of atomic weights is to be included under the title of physical chemistry, the Royal Institution is well represented by the fifteen communications of Alexander Scott on this subject which included carbon, nitrogen and tellurium and the combining ratio of carbon monoxide and oxygen.

With the advent of Sir W. H. Bragg the Davy Faraday laboratory became the centre of research in X-rays and crystal behaviour and there are few Universities in this country where the torch of this learning has not been carried and where it is still furiously burning. Other workers in the laboratory during this period included Astbury, Bernal, Caspari, Childs, Cox, Gibbs, Miss Knaggs, Mrs. Lonsdale, Mattiën, Robertson, Robinson, Shearer and Weiss.

#### 24 Years of Muller

In conclusion I must mention the name of Alexander Muller. Muller was admitted to the Davy Faraday laboratory in 1923, and during the past twenty-four years has pursued his work on the application of X-rays. He will be especially remembered by chemists and physicists for his now classical work on the measurement by X-rays of long chain compounds, and by engineers and designers for his development of the spinning target generator. In the laboratory a 50 kW machine is a memorial and witness to his great skill both as a designer and experimentalist. Those who knew Muller had a great affection for him. If ever a worker had absorbed the spirit of the Davy Faraday laboratory of the Royal Institution it was he.

# SYNTHETIC PRODUCTION OF PETROLEUM—II

## The Fischer Process

by MAJOR KENNETH GORDON

**T**HE Fischer process consists of passing carbon monoxide and hydrogen over a catalyst at relatively low temperature and at relatively low pressure. The reaction is one between carbon monoxide and hydrogen with elimination of the oxygen as water. There is a very considerable evolution of heat, and hence of course the process has inherently rather a low thermal efficiency.

A big chemical engineering difficulty in the process is the disposal of this quantity of heat without allowing the temperature of the gases to vary from the optimum by more than a very few degrees. The volume of catalyst required, particularly at atmospheric pressure, is very high, and its upkeep and replacement form a very substantial item of the cost.

Some of the newer German plants work at about 15 atmospheres pressure, but the results were very little different from those operating at low pressure. The German capacity for the Fischer process was not enlarged during the war and it was maintained at about 500,000 tons a year.

The type of converter design employed by the Germans consisted of a very large number of finned tubes embedded in the catalyst mass, and water circulated in these tubes provided control of the temperature, and at the same time a considerable quantity of steam for use in the factory.

### Fischer v. Hydrogenation Process

The Fischer process differs from the hydrogenation process in that, while the hydrogenation process provides if required one single product, that is to say petrol of a required specification, and no by-products, the Fischer process produces a wide range of by-products stretching from hydrocarbon gases at the one end to solid wax at the other. A typical distribution of the products of the Fischer process is:

- 14 per cent by weight of gaseous hydrocarbons
- 47 per cent by weight of light oil boiling in the petrol range
- 28 per cent by weight of distillate oils
- 11 per cent by weight of wax.

The pressure process gives more wax, and less light oils. The products are largely straight chain hydrocarbons and by changing the conditions can be obtained more or less olefinic. Petrol of this nature has a very low octane number—in the region of

50, and would in this country be completely unmarketable.

The middle oil fraction would by the same token have ignition properties making it suitable as a diesel oil. The Germans indeed used it as a blend with tar oils which have the opposite properties, and thus made available substantial quantities of diesel oil. Care must, of course, be taken to eliminate the wax when used for this purpose. The wax is not dissimilar from that available from petroleum sources except for its olefin content. It is particularly suitable for the manufacture of synthetic fats. This is of some little interest but it cannot be said that the product would be widely acceptable either in the form of soap or in the form of margarine in this country. It is this facility for making straight chain mono-olefins which renders the Fischer process of interest to the chemical industry as a provider of raw materials.

### Similar Operating Costs

So far as can be ascertained by our studies in Germany, both the capital and operating costs were very similar to those for the hydrogenation process, the general opinion being that the Fischer process costs were a little higher. Having regard to the fact that the Fischer process makes a crude product which would require further treatment before marketing, there is little doubt that, as worked in Germany at least, the process would be substantially more expensive than hydrogenation. Any comparison must be treated with reserve because the products are so different and the processes are really complementary rather than competitive.

Some 70 per cent of the cost of the Fischer process is represented by the synthesis gas, the balance being the cost of the conversion section itself. This conversion section is certainly susceptible to very great improvement from the chemical engineering point of view. The fluid catalyst technique developed during the war in America is one possible solution of the problem, but there are others, and there is little doubt that considerable improvements can be made to the process as employed by the Germans. Both the Fischer and hydrogenation processes use a similar amount of coal per ton of oil, about 6 tons.

The synthesis gas, which accounts for about 70 per cent of the cost, is, of course,

the mixture of carbon monoxide and hydrogen which is the raw material for the process. It is to the reduction of the cost of this gas that we must look chiefly for cheapening the cost of the process as a whole. Such an improvement would, of course, also produce a considerable reduction in the cost of the hydrogenation process.

In the Fischer process we require 11,000 cu.m. of synthesis gas per ton of product. For a ton of motor fuel by the hydrogenation process we need from 1000 to 3600 cu.m. of hydrogen, according to the raw material used, and the product made. In the Fischer process some 70 per cent of the cost of the process is the cost of the synthesis gas; in the hydrogenation process the cost of the compressed hydrogen is some 40 per cent of the total operating cost.

### Synthesis Gas Production

In Germany the synthesis gas generally made from water gas, which in turn was made by gasification of bituminous coal coke. An adjustment to the proportion of hydrogen was made either by subjecting some of the gas to reaction with steam in the presence of a catalyst by the well-known process employed on such a big scale in the synthetic ammonia industry, or by adding coke oven gas to the water gas generators during the make period. This provides additional hydrogen, partly from the hydrogen in that gas and partly by thermal decomposition of its methane content.

There was considerable development in Germany during the war in gasification processes but they were mostly operated in conjunction with hydrogenation plants and were entirely directed to the utilisation of cheap low-grade fuel, in place of bituminous coal coke.

Many of these processes employ oxygen. Our studies of them have revealed little of direct application or interest to British conditions. A new process for gasification is one of the things we must look for in order to cheapen the cost of any method of making synthesis gas.

In countries where natural gas is available, as for example in America, there is already a very cheap process available for the manufacture of synthesis gas—the so-called methane steam process. In this process the hydrocarbon gas is mixed with steam, purified from sulphur, and passed over a nickel-containing catalyst at about 700°C. Under these conditions a mixture of carbon monoxide and hydrogen is produced containing less than 1 per cent of hydrocarbons. The process is very economical and simple, and has a thermal efficiency of about 74 per cent. It has been employed in this country in conjunction with the hydrogenation process to make part

of the necessary hydrogen from the surplus hydrocarbon gases. The methane steam process was considerably developed in America during the war, on designs based on information supplied by us, for the manufacture of synthetic ammonia.

### German Alternative Process

The Germans, for some reason, employed this process at only one of their factories, that at Pölitz. They were developing an alternative process in which the heat is provided by partial combustion of the hydrocarbon gases with oxygen. The special steel tubes necessary for the furnace are eliminated, but an oxygen plant must, of course, be operated. Our studies in Germany did not reveal that any great economic advantages could be expected from this development.

The schemes for the cheap production of petrol from natural gas in America, which have given themselves some little publicity lately, seem to utilise some such process for the production of their synthesis gas. Unfortunately, in this country we have no large sources of natural gas available. We are, therefore, driven for our developments to work out some new process, more economical than the present, for the production of synthesis gas from coal.

### Official Notice

#### Petroleum-Bisulphide of Carbide

The Home Secretary has made an order varying Regulation 12 of the Bisulphide of Carbon (Conveyance) Regulations, 1935 (c) which provides that if electric lighting is employed on a tank wagon in which bisulphide of carbon is being conveyed by road the pressure shall not exceed sixteen volts. The maximum permissible voltage pressure has now been raised to twenty-four.

### India's Chemical Imports

During the half-year ended September 30, 1945, India imported chemicals (including drugs and medicines) to the value of Rs.5 Crores (£4 millions), the figures for the same period of 1946 being Rs.6 Crores (£5 millions). Imports of dyes and colours for the same two periods were Rs.4 Crores (£3 millions) and Rs.5 Crores (£4 millions).

### Argentine Import Rates

Circular No. 802 issued by the Argentine Central Bank on July 16, modifies the rates of exchange for imports of insecticide for flies (liquid in drums), concentrated denominated DDT liquid insecticide, insecticide for locusts, and peroxide and borate of manganese.

## PLASTICS FROM THE PETROLEUM INDUSTRY

**T**HE constant changes attendant upon developments in the field of plastics, and especially in the utilisation of new raw materials, cannot fail to produce repercussions over a wide range of industries, particularly in those cases where plastic manufacturers have transformed erstwhile waste products into promising raw materials. In other directions it may be possible to find new uses for by-products, and eventually lead to revision of processing methods. The change of emphasis in plastics manufacture from the employment of cyclic resins, largely a product of the coal-tar industry, to acyclic resins, most of which can be produced from petroleum derivatives, comes at a time when serious attention is already being focused on petroleum as a source of supply for a whole series of much used chemicals.

### Plastics for the Oilfields

At the same time come reports of developments in an opposite direction. From petroleum, which constitutes an important raw material for the production of plastic products, the wheel of progress turns full cycle, with news of plastic products carving out for themselves a prominent position in the realm of oilfield equipment. Such plant, by the very nature of the operations in which it is employed, is called upon to withstand conditions necessitating frequent replacements with a consequent hold-up in production. Crude oil as pumped up from the wells contains salt water and sulphur, both of which have markedly corrosive effects on the pipe-lines. In addition, the crude oil leaves a coating of paraffin wax on the inside of the pipes thus restricting delivery rate as well as necessitating expensive scraping operations. These cannot be undertaken without prejudice to the protective oxide coating and so accelerating active corrosion. The removal of water and entrained oxygen by means of de-aerators has proved too expensive, while most corrosion inhibitors present difficulties owing to their tendency to react with the petroleum, a striking exception being sodium nitrite, which has proved effective in a number of cases.

### New Thermosetting Materials

Laboratory work extending over a considerable period has resulted in the evolution of a phenol resin-derived thermosetting coating material which may well be regarded as one of the main weapons against corrosion in the petroleum industry. The product is a "tailor-made" compound which by the inclusion of appropriate pigments, plasticisers and solvents, provides the maxi-

mum protection against corrosion, assures flexibility and confers a marked resistance to the deposition of paraffin wax. Early difficulties in bonding of the plastic coating to the metallic base, i.e., blistering and subsequent loosening, were overcome by introducing a pre-coating treatment comprising pickling, degreasing, rinsing and shot-blasting. Several coats of the plastic material are then applied to the pipes in specially constructed ovens at a temperature of 300°F. A final baking at 450°F. completes the process.

### Longer Life—Less Maintenance

Experience has proved that plastic coated lines have a much longer life and call for much less maintenance than those pipe lines not so treated. Equipment located in such a way that it cannot be readily examined, has been tested for signs of corrosion by passing water through it. The water upon emerging was found to have no iron content. The value of this assurance with equipment so positioned has only to be mentioned to be appreciated. In the case of materials exposed to the corrosive action of salt water, results obtained can only be described as spectacular. Equally successful has been the employment of this plastic coating in the chemical products section of petroleum plants; a good example of the service of equipment so treated is to be found in fittings and pipes exposed to the action of sulphur and of aluminium chloride at high temperature. While untreated equipment called for replacement at the end of 14 days, plastic coated units were still serviceable after a period of nine months. Paraffin deposition on the interior of pipes has been largely eliminated by the smooth surface of the plastic coating.

### Storage Tank Preservation

A similar process employing a chemically inert thermoplastic liquid resin has proved effective in the preservation of oil storage tanks exposed to the severe corrosive conditions occurring in the storage of crude oil. The preparation of the surface to be treated is again important, cleaning and sand-blasting being necessary in order to provide a suitable surface. The liquid coating may be applied by brush, dip, or spray (four coats are necessary) the whole process taking from 2½ to 4 days according to the nature of the preliminary treatment.

The coating so applied remains in a semi-plastic state, and forms a firm bond to metal, clean, unpainted wood, or to concrete. Tanks treated in this manner can be steam-treated without injury, but

prolonged exposure to temperatures above 180°F. should be avoided. Paraffin wax will not cling to surfaces so treated while electrolytic and bacterial action are arrested. While prolonged exposure to most acids and alkalis at normal concentrations has no effect, aromatic hydrocarbons and chlorinated solvents have a softening effect.

Turning from storage tanks, which may be considered as items of a final process if refining is disregarded, plastics have also been recently employed in the initial operations of well sinking and soil consolidation. Used in this capacity, plastics are thermosetting materials with a specific gravity approximately equal to that of water and are dark brown in colour. The temperature

range at which these plastics set extends from 50° to 350°F.; the state of solidification attained after being placed in the well is governed by the temperature at which the plastic is applied, pressure having no effect. It is essential therefore that the temperature at the working depth be known within very close limits. The actual time required for solidification can be controlled by the action of catalysts which have no effect on the physical properties of the plastic after setting. An average setting time is eight hours.

The foregoing developments represent one aspect of a reversible cycle; plastics and petroleum, petroleum and plastics. Future advances in both directions are awaited with interest.

## NEW SWEDISH IMPORT REGULATIONS

### Additions and Deletions to "Free List"

**T**HE "Free List" of goods, i.e., those not requiring licences on importation into Sweden has been amended by a Swedish Royal Proclamation dated July 10, its terms becoming operative from July 27 last.

Goods which until July 27 were on the "Free List" but have been deleted, may be imported without licence provided they had been loaded for direct shipment to Sweden before August 2 or had been paid for in full before the new list came into force.

Deletions from the "Free List" are as follows:

#### SECTION V

##### *Mineral and Fossil Products*

Asbestos, bauxite, gypsum, emery, carboric acid and carcol.

#### SECTION VI

*Chemical and Pharmaceutical Products; Colours and Varnishes; Perfumes, Soaps, Candles and other articles manufactured with oil, fat and wax; Glues and gelatine; Explosives; Fertilisers*

Glycerine, potassium hydrate (caustic potash), sodium hydrate (caustic soda), calcium chloride, wood spirit, (methanol), esters derived from phthalic acid, *n.s.m.*, lamp black, and similar black colouring substances, *n.s.m.*, cobalt oxides.

#### SECTION XV

*Non-Precious Metals and manufactures thereof*  
Iron alloys and silicate.

#### SECTION XVI

##### *Machines, Apparatus and Electrical Plant*

Steam boilers, heaters, *n.s.m.*, tanks and furnaces, fitted with mechanical appliances, provided that these articles chiefly consist of malleable iron; manufactures of rolled iron plate for boilers; furnaces for steam boilers and gasworks; grates for such apparatus; economisers and parts thereof; ovens for industrial purposes, also forges and bellows; rolling mills for the metal industry, steam hammers, pneumatic hammers, spring hammers, rams, pumps and separately imported outer coverings and inner rotating parts thereof, centrifuges, *n.s.m.*

#### SECTION XX

##### *Goods not mentioned elsewhere*

"Bakelite" and other artificial resins intended to be pressed, capable of hardening or hardened, also manufactured of these materials, *n.s.m.*, even containing paper, textile materials and the like: plates and tubes; "Celluloid," "Cellone," "cellophane," "gandafl," "galalithe," "ambroin," "eburin" and other similar artificial plastic materials not classified under any other heading; unwrought, also cellulose acetate.

Additions are as follows:

#### SECTION V

##### *Mineral and Fossil Products*

Felspar, graphite.

#### SECTION VI

##### *Chemical and Pharmaceutical Products, etc.*

Selenium, bromine, iodine, arsenic, phosphorus hydride, carbon sulphide, sulphur, chloride, phosphorus sesquisulphide, potassium and sodium sulphide and lepar sulphuric, ethylene oxide with or without admixture of carbonic acid, fast dissolving re-agents constituting products for the sulphurisation of carburetted hydrogen or of fat, oxalic acid including potassium sodium and ammonium oxalates, sodium acetate, chrome, iron and cobalt acetates, lead acetate (sugar of lead) and lead vinegar, manganese dioxide, ammonium chloride, tin salt, tin chloride and tin oxide, bromides and iodides of metal or ammonium not referred to elsewhere, nickel sulphate and nickel ammonium sulphate, sodium sulphite, potassium nitrate, sulphylic acid salts or hydro-sulphurous acid salts combined or not with formaldehyde, acetone and the like. Add the words "and liniment" after "druggists' goods." Animal charcoal and bone black, siccatives consisting of metal compounds of fatty resinic or naphthenic acids.

##### *F. Glues, Gelatine, etc.*

Roller, autograph and hectograph compositions, including manufactures thereof.

## BELGO-DUTCH AGREEMENT

### Free Fertiliser Exchange

**U**NDER the terms of the 1944 Customs Agreement signed between the Belgo-Luxembourg Economic Union and the Netherlands, and the interpretative Protocol signed in March of this year, provision is made for the application of a common customs tariff for imports of goods into the territories of the contracting parties. Section VI—Chapter 35 of the agreement provides for the free exchange of the following fertilisers: (1) potassium nitrate (unrefined), (2) ammonium phosphate, (3) potassium phosphate, (4) compounds with a base of ammonium nitrate or ammonium chloride, and, (5) other fertilisers not specified or included elsewhere.

## American Chemical Notebook

From Our New York Correspondent

THE Bolivian Ambassador to Washington, Ricardo Martinez Vargas, this week predicted that if the United States wants more of his nation's tin she will have to pay more than the present price of 76 cents a pound. At the present time discussions are being held in Washington between Ambassador Vargas and Norman Armour, Assistant Secretary of State, for the purposes of negotiating a new contract; it is not expected to be concluded before the end of next month.

Existing arrangements between the United States and Bolivia, provide for the former to receive 12,000 tons of Bolivian tin with the balance of the latter country's output going to Great Britain and Argentina. According to Ambassador Vargas, the new contract will enable the United States to obtain a larger proportion of Bolivia's tin for which she will be willing to pay an increased price.

A new organic chemical, not previously disclosed in the literature, 2-Mercapto-4,6,6-trimethyl thiazine (M.T.M.T.), was announced this week by S. L. Broas, manager of the new products department of the B. F. Goodrich Chemical Company, Cleveland, Ohio. M.T.M.T. is a yellow, crystalline material, insoluble in water but soluble in ketones and esters. Heterocyclic in nature, it reacts as a tautomeric compound with the active hydrogen atom shifting from sulphur to nitrogen as the reaction conditions are changed. Esters, metal salts and other derivatives are prepared readily and in good quantities. M.T.M.T. is easily dimerised, the dimer itself being quite reactive.

As an intermediate, the new organic chemical is expected to be used extensively in the manufacture of wetting agents, pharmaceuticals and other chemicals. A detailed technical bulletin and samples are available upon written application to the New Products Department, B. F. Goodrich Chemical Company, 324 Rose Building, Cleveland 15, Ohio.

Following an extensive study of patent literature in connection with an investigation in the field of powder metallurgy at the United States National Bureau of Standards, a comprehensive list of powder metallurgy patents has been compiled and is now available. Representing more than a century of progress this valuable source of technical information, which was obtained from a collection search of 2253 patents, has been classified into related groups with a short abstract for each invention.

Published technical literature relating to this field, of comparatively new and un-

developed science, is widely scattered, making it difficult for metallurgists to keep abreast of developments. For this reason, the National Bureau of Standard's listing and analysis of the patent literature classified according to production, handling and working, alloying and application, should prove useful to those engaged in research and development in powder metallurgy. The publication, NBS number M184, *United States Patents on Powder Metallurgy*, by Raymond E. Jager and Rolla E. Pollard, is available from the Superintendent of Documents, Washington 25, D.C., 30 cents each.

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While the unconjugated diolefinic hydrocarbon, vinyl cyclohexane, has up to now been available only in laboratory quantities, in future it will be available in commercial quantities, states an announcement by the chemical division of the Koppers Company, Pittsburgh, Pa. Although the new material is still more or less in the course of development, Koppers is making it commercially available because it appears to be a useful materials for the production of synthetic organic chemicals by virtue of the fact that its chemical structure is such that it can undergo a wide variety of chemical reactions. Furthermore, since it does not polymerise readily, it may be stored under normal conditions. The finished product contains no inhibitor.

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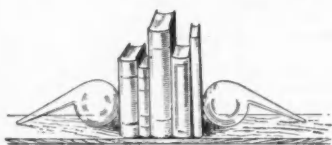
A chemical safety data sheet on aqua ammonia, setting forth important physical and chemical properties of the product and offering suggestions for the safe handling of the chemical has been issued by the Manufacturing Chemists' Association of the U.S. as the thirteenth in its series of chemical product safety manuals. Its title is SD-13—*Aqua Ammonia*—and it is available at 20 cents per copy from the Association's office at 608 Woodward Building, Washington 5, D.C.

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This week ground was broken at Niskayuna, New York, for the \$20,000,000 Knolls Atomic Research Laboratory\* which will be built under the supervision of the U.S. General Electric Company for the United States Atomic Energy Commission.

The first shovelful of earth at the site of the new laboratory, which overlooks the Mohawk River, was turned by Dr. C. G. Suits, vice-president of the General Electric Company, who will direct the new laboratory, fifth in a series being established by the Atomic Energy Commission.

\* A preliminary note together with an artist's impression of the new laboratory appeared in *The Chemical Age* (p. 321) of March.



## A CHEMIST'S

### BOOKSHELF

**British Science News**, published by Science Department, The British Council, London, W.1, is a new publication, replacing the hitherto Monthly Science News. It will be a larger edition and will contain some longer and more specialised authoritative articles besides some book reviews and other items of general interest such as particulars of British Scientific Conferences. The first number which has just appeared is a special chemistry issue of the Centenary Celebrations of the Chemical Society. Although this first number deals mainly with the history and development of chemistry, future numbers will not be restricted in scope, but should appeal to the general scientific reader.

#### **Thorpe's Dictionary of Applied Chemistry.**

Fourth Edition, Volume VIII. *Meth-Oils, Essential*. Longmans, Green and Co., London 1947. Pp. 679. Price 80s. net.

The present volume of this dictionary, inaugurated by the late Sir Edward Thorpe and now being published under the experienced editorship of M. A. Whiteley, follows on the traditional lines laid down for the previous volumes. The long list of contributors comprises well-known names of university scientists and experts in the employ of industrial concerns notable in particular fields of specialised knowledge. It is always welcome to find a close and cordial contact of universities and industry. Thus the names of the various writers and the established standard of the book are sufficient guarantee of its general excellence, comparable, for instance, with Beilstein's *Handbook of Organic Chemistry*.

The new edition can be regarded as an entirely remodelled and up-to-date version of the last issue and the various subjects are dealt with in a manner justified by the advancement during the period that has intervened since the last edition was published in 1927 with supplementary volumes up to 1936.

The articles of the book, beginning with *Methal* and ending with *Essential Oils*, are written with special minuteness of detail, and signed by famous authorities. The "dictionary" style, however, has been maintained throughout. The monograph on *Methylantracene* and other Substituted Anthracenes (by R. F. Thomson), covers 35

pages with literature references as far back as 1869, and the article (by the late W. F. Boston) on *Michochemistry*, divided into three distinct sections, deals with the use of "drop-reactions" in inorganic qualitative analysis, selected microchemical manipulative methods, and organic micro-analysis respectively. Milk is dealt with by J. H. Bushill and H. S. Rooke and contains 15 tables on Dairy Science. Mineralogists will be interested in the monograph on Minerals and X-Ray Analysis (by F. A. Banister) with many tables compiled from the literature to give an alphabetic list of crystal structures, as well as in the chapter on Geochemistry of Minerals (by V. M. Goldsmith and A. Muir). The article on Molecular Spectra, Visible and Ultraviolet (by R. A. Morton), will commend itself as a comprehensive treatise. E. H. Rodd and Colleagues of the I.C.I. Manchester, sign the very full monographs on Naphthalene and its Derivatives (pp. 263-498) and A. E. Hanson of the Mond Nickel Company wrote the articles on Monel and Nickel. Mention should also be made of the monograph on Nitrogen-often quoted as the element of the future (by J. H. Quastel, pp. 594-620) and finally on *Oils, Essential* (by T. H. Durrans).

The inclusion of an accurate index by Dr. J. N. Goldsmith is most welcome and makes the book so much more handy for the general chemist and the expert alike. The work as a whole when completed will be the most useful, even indispensable up-to-date encyclopædia of applied chemistry.

### FAITH IN THE FUTURE

#### **W. J. Bush Chairman's Confidence**

Dr. Percy C. C. Isherwood, chairman and managing director of W. J. Bush and Co., Ltd., spoke confidently of Britain's future when he addressed the 50th annual general meeting of the company in London recently. He concluded his remarks by saying:

"I would like to close these remarks with an expression of faith. Our national history shows that this old country has great resilience and recuperative powers. To this the fine chemical industry and its ancillary activities are no exception."

## Home News Items

**Address Change.**—Spillers Central Laboratory (Spillers, Ltd.) will function at Station Road, Cambridge as and from August 28.

**July Steel Output Lower.**—Production of steel ingots and castings during July was at an annual rate of 11,007,000 tons, a figure that compares with 13,206,000 tons in June, and 11,759,000 tons in July 1946.

**Cheaper Quicksilver.**—Mercurio Europea, the Italo-Spanish quicksilver group, has reduced its U.K. selling price from £17 3s. 6d. to £16 per flask, ex warehouse, London. The c.i.f. U.K. quotation, formerly £16 12s. 6d., is now £15 8s.

**B.B.C. Publicity for E. M. & F. Exhibition.**—B.B.C. broadcasts on the North American, African, General Overseas Services have recently been given to publicise the Engineering & Marine and Foundry Exhibition to be held at Olympia from August 28 to September 13.

**Fertiliser Society Meeting.**—The Fertiliser Society is to hold a meeting on October 10 at the Lecture Hall of the Royal Society of Tropical Medicine. An address entitled "Granulation of Phosphatic Fertilisers" will be given by Mr. Sven Nordengren, a well-known Swedish chemical engineer.

**Petroleum Board Ends.**—The Ministry of Fuel and Power has announced that the Petroleum Board will cease to function as from December 31 next. For the time being control of prices and imports will remain with the Ministry, but the various marketing companies will resume distribution of branded petrol on their own account.

**Change of Address.**—British Industrial Solvents, Ltd., have acquired new premises to house their entire head office staff, and are accordingly closing their evacuation office at Belmont, Surrey. As from August 15, 1947, their only London address has been 4, Cavendish Square, London, W.1. (Telephone: Langham 4501), to which all communications should be sent.

**Plastic Wood.**—Claiming to have produced, with the aid of a German refugee scientist, a new plastic-type material of special industrial value derived from the action of bacteria on wood flour, Thomas Gordon, a Baillie of Anstruther, Scotland, has opened offices to exploit the process, at Princes House, Piccadilly, London, W. Said to have been the product of 12 years' research, the new plastic wood can be moulded, turned or machined in any way and may prove to be a valuable timber substitute.

**Decontrol of Soft Drinks Industry.**—The Minister of Food has approved a plan to deconcentrate the soft drinks industry put forward by the Soft Drinks Industry (War Time) Association. It will come into operation on October 12.

**Mineral Water Factory Re-opened.**—The mineral water and pure malt vinegar factory of W. Ganson & Co., Cornaro Works, Hove Edge, Halifax, which was closed under war conditions in February 1942, has been acquired by Messrs. J. Scott and J. Sidey (of Bolton Direct Supply Co.).

**Social Conditions in Britain.**—A course arranged by the British Council and entitled "Social Conditions in Industrial Britain" was held in Birmingham from July 26 to August 16. It was attended by 21 social workers from Czechoslovakia, Finland, France, Hungary, Italy, Norway and Sweden.

**Change of Ownership.**—A group under the leadership of Industrial, Finance and Investment Corporation has acquired a controlling interest in Minerals Separation, Ltd. No change of management of the company is involved, and the board further announce that Minerals Separation has bought an interest of over 90 per cent in Howard Pottery Co., Stoke-on-Trent.

**New Uses for Nylon.**—Nylon rope and cordage are being utilised for industrial and commercial purposes following their successful use during the war years. The products possess self-recommending rot-proof and fire-proof qualities. British Ropes, Ltd., who have begun a campaign to familiarise rope and cordage users with these products, it is learned, will operate a demonstration van at principal British centres in the near future.

**Death at Atomic Site.**—A man was killed and another seriously injured when a concrete floor gave way beneath them as they were helping to clear the site for Britain's first atomic energy power station at Sellafield, Cumberland, on August 15. The floor, 160 ft. square, in a former Royal Ordnance factory, was dislodged when an iron girder slipped out of position, and it hurtled down in pieces and buried the two men.

**Aluminium Replaces Timber.**—Because of the timber shortage, the Northern Aluminium Co., Ltd., has adapted aluminium as a packaging material for its export consignments. The company is using aluminium "envelopes" with waterproof tarred liners, sealed and durable as containers for its export lots of sheet metal. Important economy of stowage space is an incidental merit of this new type of pack.

## Personal

MR. N. G. McCULLOCH, for 18 years a director of the Calico Printers Association, has been appointed deputy chairman.

MR. MONTAGUE TEMPLE has relinquished his directorship of the Standard Candle Company.

DR. R. T. COLGATE, works chemist to Messrs. Huntley and Palmers, has been awarded this year's Medal of the Society of Chemical Industry.

DR. E. B. BENDER, director of the research laboratories at the Du Pont experimental station, has retired after 30 years' service with the company.

MR. HENRY BURNS, of Messrs. Thomas W. Ward, Ltd., left Great Britain last week for New Zealand where he is to open and take charge of that company's new office there.

DR. SADGOPAL, formerly Technical Director of the Hindustan Aromatics Co., Naini-Allahabad, has been appointed Professor of Oil and Soap Technology in the Department of Industrial Chemistry at the College of Technology, Benares Hindu University.

DR. H. ROXBEE COX, the Ministry of Supply gas turbine expert, was decorated at a special investiture ceremony on Monday, August 18, with the American Medal of Honour with Silver Palm by Major General Clayton L. Bissell.

A presentation to mark his 50 years in the soap trade has been made to MR. JOHN FEARNETT, of Port Sunlight, by Mr. G. A. S. Nairn, chairman of Messrs. Levers Bros. Mr. Fearnett began work at Runcorn in 1897, transferring to Port Sunlight in 1911.

MR. K. J. BOLTON (Lorilleux & Bolton, Ltd.) has been elected president of the Federation of British Printing Ink Manufacturers in succession to Mr. S. Cumbers. MR. E. BOWES (Forrest Printing Ink Co., Ltd.) has been elected vice-president.

MR. R. H. RIDLER, one of a number of service representatives appointed to assist Dunlop distributors and users, has just left on an extended tour of the Caribbean area, including Colombia, Venezuela, Central America and Mexico in addition to Cuba and the British West Indies.

MR. EDWARD THOMPSON, managing director of the John Thompson Group of Companies, returned last week from a six-month visit to Australian and South African subsidiary companies. While in Australia, he was instrumental in securing the contract for the new Yallourn power station which has a value in Australia of over £2,047,000.

DR. GEORGES PROYARD, head of the medical service of a big Belgian factory, who is just concluding a visit to Britain under arrangements made by the British Council,

has been sent by his firm (the John Cockerill works at Seraing) to study British health services in heavy and chemical industrial factories; he is also interested in the prevention and treatment of accidents.

MR. RALPH CREDLAND, who has been appointed assistant managing director of the Widnes Foundry and Engineering Co., Ltd., has been principally responsible for building up the foundry to its present large scale of activity, a work he undertook, as general manager, shortly before the last war. He has rendered good service locally as member of the Advisory Committee of the Widnes Technical College.

An award of £3000, on half-share in a patent) to MRS. B. G. MULHERN, of Merton Road, Bootle, has been recommended by the Royal Commission on awards to inventors. Mrs. Mulhern is the widow of Mr. J. A. MULHERN, whose invention in collaboration with MR. GEORGE KEENAN, Board of Trade surveyor, of Great Crosby, of an apparatus for distilling fresh water from sea water, has saved the lives of merchant seamen and aircrew at sea.

DR. BOYES (Allen and Hanbury, Ltd.), MR. HOLLIES (Boots Pure Drug Co., Ltd.), MR. REID (Evans Medical Supplies), MR. A. G. FISHBURN (I.C.I.), MR. W. D. KEMP (May and Baker, Ltd.), and MR. FALDER (Wellcome Foundation, Ltd.) were present at a dinner given by the Pharmaceutical Society at the Holborn Restaurant recently in honour of seven Chinese students who had just graduated as Bachelors of Pharmacy. Each of the above-mentioned manufacturing houses, together with Glaxo Laboratories had "adopted" a student and had thus made possible the establishment of the scholarships.

## Obituaries

MR. JAMES BRUCE, past chairman of the Glasgow section of the Society of Chemical Industry and chief Glasgow representative of I.C.I. Dyestuffs Division, has died at the age of 62.

MR. JAMES WILLIAM BROOKS, manager of Sowerby Bridge sewage works, died on August 1 at the age of 60. He had been employed by Sowerby Bridge Council 40 years, and had been sewage manager for 28 years.

MAJOR VICTOR LEFEBURE, who died last week at Golders Green, was an authority on chemical warfare having been a member of the Directorate of Gas Services on the Western Front during World War I. He served on the Civil Defence advisory committee on air raid precautions during World War II.

## Overseas News Items

### U.S. Ammonium Sulphate Price Up.

From the beginning of August, U.S. ammonium sulphate, f.o.b. ovens, was increased by 5 cents to 35 cents per ton.

### French Supply Caustic Soda to U.S.A.

The U.S. scarcity in caustic soda has been slightly eased by the arrival of 375 tons of French supplies, with a further 2000 tons likely.

**Mexico City Pipeline.**—Petroleos Mexicanos, Mexico City, has built a 26-inch natural gas pipeline between Mexico City and Poza Rico at a cost of ten million dollars.

**Underground Gasification.**—A Belgian experiment to fire coal underground and conduct the gases to the surface where they will be used to drive electrical generators is to start in the Liège district early in September.

### Higher American Fats and Oil Output.

According to the U.S. Bureau of Agriculture, production of oils and fats in the first six months of the current year exceeded that for the corresponding period of last year by some ten per cent.

**Argentina's Paint Industry.**—In order to utilise its large linseed output in pursuance of its comprehensive industrialisation programme, Argentina plans to erect a number of paint factories to supply products to both the home and overseas markets.

**Vitamin A Produced Artificially.**—Two Dutch chemists are reported to have discovered a method for preparing vitamin A by artificial means. The raw material is said to be a tropical grass normally used for the extraction of perfume.

**New U.S. Caustic Soda Production Method.**—The well-known Mathieson Alkali Co. announces that it is soon to licence a new stationary mercury cell for the production of caustic soda at a lower cost than is possible with present methods. It is stated that works are being erected in Canada and in Latin America.

**Protest to Hungary.**—Four Soviet-Hungarian companies, namely the Hungarian-Soviet Bauxite and Aluminium Company, the Hungarian-Soviet Oil Works, Ltd., the Hungarian-Soviet Air Transport Company, and the Hungarian-Soviet Navigation Company, have been granted privileges inconsistent with the peace treaty, alleges a note received by the Hungarian Government from the British Government. The four companies concerned are said to be benefiting from certain tax exemptions, not at present enjoyed by British companies in Hungary.

**Copper and Tungsten in Italy.**—In Northern Italy copper deposits are reported to have been found near Bolzano (Bozen) and tungsten deposits in the valley of Fierme.

### U.S. Chemical Worker's Wage Demands.

—A "cost-of-living" increase of 23.5 cents per hour is being aimed at by the U.S. United Chemical Workers, an organisation forming part of the C.I.O.

**New U.S. Chemicals Sales Company.**—The Commercial Chemical Development Association, a new U.S. corporation, has recently been established to market chemical products.

**Magnetite Deposits Discovered in Austria.**—An occurrence of magnetite was recently discovered near Fieberbrunn, Austria, and a plant for its exploitation is to be erected at Hochfilzen.

**Austrian Copper Production.**—The Brixlegg mines in Austria, which had been almost completely destroyed in the final phase of the war, are reported to be producing again at an annual rate of about 5000 tons.

**Russo-Polish Trade.**—Under a new trade agreement signed recently in Moscow, Russia is to supply, among other goods, iron and manganese ores, ferrous alloys, oil derivatives and chemicals, in exchange for non-ferrous metals, and glass.

**Special Cement Developed in Norway.**—After many years of research, a Norwegian engineer, A. Daniels, is reported to have developed a new cement which is said to be highly resistant to water. A special metamorphosed limestone found in Sunnmøre, Norway, is mixed in to the cement.

**Austrian Carbide Output Lagging.**—The "Donauchemie," Landau, Austria's only producer of calcium carbide, is reported to be in a position to supply about 500 metric tons per month, but the lack of coal and of labour make it unlikely that the full capacity, i.e. 900 metric tons per month, will soon be reached.

**New Chemical Plant for Brazil.**—Because of delays in receiving machinery and equipment from the United States, construction of a chemical plant at Goiabal, near Volta Redonda, Brazil, intended for the production of explosives and sulphuric and nitric acids is progressing slowly. However, the plant, known as Industrias Químicas Brasileiras Duperial, is expected to be in operation by the latter part of 1948. The plant is jointly owned by United States and British interests.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

**CHEMICAL & INSULATING CO., LTD.,** Darlington. (M., 23/8/47.) Satisfaction July 8, £50,000, registered December 7, 1932.

**TOWNSON & MERCER LTD.,** Croydon, chemical and scientific apparatus manufacturers. (M., 23/8/47.) July 15, charge, to Barclays Bank Ltd., securing all moneys due or to become due to the Bank; charged on land at Beddington Lane, Croydon. \*£8403, May 4, 1946.

**ASSOCIATED CHEMICALS, LTD.,** Richmond, Surrey. (M., 23/8/47.) July 17, £3610, £2650 and £1750 mortgages, to Abbey National Building Society; respectively charged on 2 The Green, Richmond, Surrey, and 2 and 4 Claremont Road, Teddington. \*Nil. December 20, 1946.

## Company News

The nominal capital of **Westminster Laboratories, Ltd.,** 7 Chalcot Road, Regents Park, London, N.W.1, has been increased beyond the registered capital of £10,000, by £40,000, in £1 ordinary shares.

The name of **South Wales Vapour Testing Company Ltd.,** Powell Duffryn House, Cardiff Docks, has been changed to British Vapour Testing Company Limited, as from July 8, 1947.

The nominal capital of **Ace Products (Manchester), Ltd.,** chemical manufacturers, etc., Hillside Works, Manchester Road, Wilmslow, has been increased beyond the registered capital of £2000 by £4000 in £1 shares.

**International Bitumen Emulsions** has announced a profit for the year ended March 31, of £46,569 as against £24,882 for the previous year. A dividend of 15 per cent is recommended, an increase of 5 per cent over last year.

**Major & Company,** chemical manufacturers, has reported a profit for the year ended March 31, of £18,983, as against the previous year's figure of £25,108. An ordinary dividend of 7 per cent is recommended, comparing with 6 per cent last year.

## New Companies Registered

**Stein, Branik & Stein, Ltd.** (440,438).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in and agents for chemicals, gases, drugs, etc. Subscribers: S. H. Yeomans, and P. C. Evans. Secretary: Miss Edna Dufman, 28 Maddox Street, W.1.

**Alfa Plastics, Ltd.** (440,137).—Private company. Capital: £5250 in 5000 "A" shares of £1 and 5000 "B" shares of 1s. Manufacturers of and dealers in plastic and metal goods, chemicals, etc. Directors: E. C. Graham and G. A. Rohoncz. Registered office: 61 Mark Lane, E.C.3.

**Mineralisation, Ltd.** (439,949).—Private company. Capital £15,000 in 15,000 shares of £1 each. Industrial advisers and consultants, consulting engineers, research workers, processors of all types of fuel and their by-products, etc. Directors: L. Jones and M. Jones. Registered office: Crown Square, Matlock.

**Hudson and Towle, Ltd.** (440,089).—Private company. Capital £500 in £1 shares. Importers, exporters and manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Subscribers: F. F. Harmer, and S. Hyde. Secretary: W. H. French. Registered office: 21 Cardiff Road, Luton.

**Southall Bye-Products, Ltd.** (439,888).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, drugs, medicines, disinfectants, fertilisers, etc. Directors: J. O'Rell, and S. J. O'Rell. Registered office: Dairy Meadows, off Havelock Road, Southall, Middlesex.

### NATURAL MENTHOL

The Board of Trade in consultation with the Central Price Regulation Committee, has made an Order revoking the Natural Menthol (Maximum Prices) Order, 1943 (S.R. & O. 1943 No. 1285).

### ECONOMY IN COPPER TUBES

The Ministry of Supply draws attention to the need for economy in the weight of copper used in hot and cold water systems in buildings, and stresses the importance of using copper tubes as laid down in British Standard Specification 659/1944. As from August 11 manufacturers have been requested to discontinue the production of any copper tubes which do not conform to this specification.

## Chemical and Allied Stocks and Shares

**E**ARLIER in the week support for short-dated stocks inspired a rally in British Funds and there was a strong outburst of speculative activity in gold mining shares as a refuge for money during the crisis. In contrast industrial shares remained out of favour with small irregular movements predominating. Yields on many industrials are now attractive and moreover in most cases there seems reasonable prospects of dividends being maintained if there is no serious fuel shortage; but on the other hand, the market feels that the outlook is obscure, particularly as the crisis may force another Budget in the autumn with new restrictions and controls.

Among chemical and kindred shares, Imperial Chemical were down to 44s. 6d., and Lever & Unilever at 48s. 9d. only made moderate response to the good impression created by the full results and annual review. Fisons changed hands around 58s., Greeff Chemical Holdings 5s. shares were 15s. 9d., W. J. Bush 90s., and B. Laporte 92s. 6d. British Glues & Chemicals 4s. ordinary at 20s. provided a relatively steady feature and in other directions, British Xylonite at £28½ were higher in anticipation of new capital plans. Major & Co.'s 2s. shares changed hands around 3s. 3d. following publication of the full results, British Aluminium receded to 42s. 6d., De La Rue were 47s. 6d., General Refractories 22s. 6d., British Oxygen 93s. 9d., and Borax Consolidated eased to 52s. 6d. despite the interim dividend. Elsewhere, Amalgamated Metal were 17s., Dunlop Rubber eased to 69s. 4½d. while awaiting the dividend announcement, the units of the Distillers Co. changed hands around the lower level of 136s. 3d. British Plaster Board were 24s. 9d., and United Molasses 50s.

Iron and steels lost further ground, nationalisation uncertainty being increased by fears of trade union pressure on the Government. The fall of value in this section has been general and has included shares of many companies which in any case are regarded as being outside the nationalisation threat. Heavy engineering shares for example lost ground, and Babcock & Wilcox were 64s. 9d. United Steel have receded to 24s. 6d. Guest Keen were 41s. 9d., Dorman Long 25s. 6d., Stewarts & Lloyds 49s. 3d., Hadfields 22s. 9d., and Colvilles 25s. 4½d. Export trade hopes again helped textile shares which have been relatively steady, although Courtaulds came back to 46s. 3d. Gas Light & Coke eased to 20s. 4½d. reflecting reports that a Bill for nationalisation of the gas industry may be introduced in the next session of Parliament.

Triplex Glass have eased to 30s. 3d. on

doubts whether a higher dividend can be expected at this stage. Paint shares tended to come in for more attention with Pinchin Johnson 53s. 9d., and Goodlass Wall 35s. yields now being attractive at current levels and the market is assuming that the future holds prospects of higher dividends. Many paint companies will benefit substantially from the abolition of E.P.T. and trading profits are likely to be maintained. Sangers were steady at 25s. 3d., with Griffiths Hughes 46s. 10½d. Beechams deferred 22s. 6d., and Boots Drug 57s.

Oil shares have been active but fluctuated rather sharply and were lower on balance, sentiment failing to benefit from the news that the Petroleum Board is to be dissolved at the end of the year, which, however, it is officially stated will not mean the end of petrol rationing. Anglo-Iranian eased to £29½ partly owing to reports of further Russian moves in Persia. Shell were 96s. 3d., and C. C. Wakefield eased to 71s. 10½d.

## British Chemical Prices

### Market Reports

**T**HERE has not been much outstanding interest in the industrial chemicals market during the past week. The price position is unchanged and firm and there has been no evidence of any improvement in supplies. A little more activity has been reported from several sections and the flow of inquiry for new business is on an increasing scale. There have been no changes either of market conditions or prices in the coal-tar products section.

**MANCHESTER.**—Extremely firm price conditions are reported in virtually all sections of the Manchester market for light and heavy chemical products, and the tendency is for higher rather than lower rates so far as future movements are concerned. In some of the leading heavies, including soda ash and other alkalis, supplies are very tight and smaller allocations continue to be made to consumers. Deliveries under contracts are going forward steadily and additional home and export business covering a fairly wide range of products has been reported during the past week. On the whole, the fertiliser market has been slightly more active, while steady pressure of supplies of the leading tar products is a prominent feature.

**GLASGOW.**—In the Scottish chemical market no great changes can be reported apart from the return of the supply position of soda ash from very bad to the not quite so bad position of a few weeks ago. In the export market inquiries have been particularly numerous especially for acids and calcium carbonate, but there has been a demand for the whole range of chemicals.

## Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Preparation of silica containing catalysts.—American Cynamid Co. Sept. 22, 1942. 16501/47.

Organo-siloxanes and methods of making them.—Corning Glass Works. Feb. 26, 1942. 3638/44.

Process of preparing a copolymer of vinylidene chloride.—Dow Chemical Co. June 2, 1939. 16077/47.

Insecticidal composition.—Dow Chemical Co. May 1, 1942. 16328/47.

Nitrogen and sulphur containing beta-substituted carboxylic acids and method of making same.—B. F. Goodrich Co. Oct. 5, 1945. 26441/46.

Preparation of beta-acyloxy carboxylic acid compounds.—B. F. Goodrich Co. Oct. 5, 1945. 26442/46.

Insecticides.—Merck & Co., Inc. Sept. 14, 1945. 24996/46.

Method for removing weakly acidic substances from substantially neutral organic water-immiscible liquid.—Pure Oil Co. June 22, 1940. 16241/47.

Preparation of guanidine salts.—Honorary Advisory Council for Scientific and Industrial Research. Oct. 25, 1944. 11981/45.

Chemical process.—Standard Oil Development Co. Feb. 12, 1942. 16609/47.

Methods of forming complexes of basic silver compounds, and the compounds resulting therefrom.—Sunshine Mining Co. Feb. 20, 1945. 11990/46.

Preparation of synthesis catalysts for the synthesis of hydrocarbons.—Texaco Development Corporation. Jan. 4, 1946. 38010/46.

Bromine-containing olefinic compounds.—United States Rubber Co. Jan. 3, 1946. 35422/46.

Production of aluminium.—Aluminium Laboratories, Ltd. January 31, 1946. 136/1947.

Method and apparatus for vulcanising a strip of uncured rubber.—American Hard Rubber Co. February 6, 1941. 18130/1947.

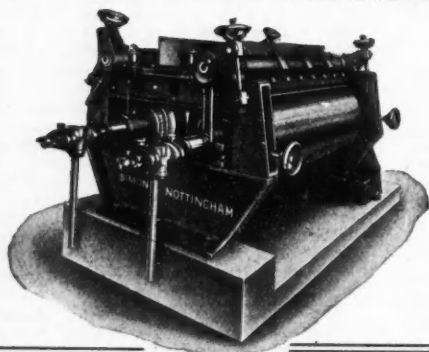
Preparation of organoboron compounds.—British Thomson-Houston Co., Ltd. October 25, 1945. 31753/1946.

Diazo-dyestuffs.—Ciba, Ltd. January 31, 1946. 2132-33/1947.

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### UNIVERSITY OF MANCHESTER

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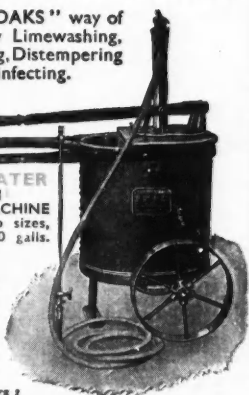
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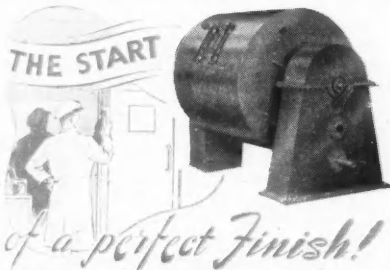
  
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